

FIRST ANNUAL CONFERENCE
OF THE
WOODS DEPARTMENT

BERLIN MILLS COMPANY
BURGESS SULPHITE FIBRE CO.
FITZGERALD LAND & LUMBER CO.
Quebec & St. Maurice Industrial Co.

HELD AT
GORHAM, NEW HAMPSHIRE
TUESDAY-WEDNESDAY, NOVEMBER 25TH-26TH 1913

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W. R. Brown

CULTY OF FORESTRY

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FACULTY OF FORESTRY
UNIVERSITY OF TORONTO

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HELD AT
GORHAM, NEW HAMPSHIRE
TUESDAY-WEDNESDAY, NOVEMBER 25th-26th, 1913



*Lewis T. Brown, Gen. Mgr.
Woods Dept. of Berlin Mills Co.
From 1868-1886

PREFACE.

The first Annual Conference of the Woods Department of the Berlin Mills Company and its subsidiary companies was called for the purpose of securing closer co-operation between those in charge of their various operations, extending throughout the New England States and Canada, and for the purpose of mutual assistance, acquaintance and enlightenment.

The Conference was opened at the Mount Madison House in Gorham, New Hampshire at 7:30 P. M., Tuesday, November 25, 1913, at which time half of the papers were given and the meeting was closed by an illustrated talk on Dog Sledding and Light Transportation by Mr. N. H. Coleman of La Tuque.

The following morning those in attendance were shown through the mills of the Berlin Mills Company and the Burgess Sulphite Fibre Company at Berlin, N. H., and returned for a Thanksgiving dinner at the Mount Madison House at 2 o'clock, which was pleasantly enlivened by informal speeches. After the dinner the second section of the papers were read, followed by an illustrated talk on the Growth of Trees by Mr. J. F. Heck of St. Raymond, P. Q., and the Conference was closed with general pictures of Logging, thrown onto the screen by Mr. A. E. Rowell of Berlin.

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GENERAL MANAGERS WOODS DEPARTMENT
BERLIN MILLS CO.

O. B. Brown
1892-1899

*Montague Brown
1907-1908

Jas. T. Parker
1886-1892

W. R. Brown
1899-date

D. F. Brown
1908-1911

SCIENTIFIC MANAGEMENT IN LUMBERING AND THE CARE OF TIMBERLANDS.

BY W. R. BROWN,

General Manager Woods Department

We are here primarily for the purpose of gathering new ideas as to securing an immediate or ultimate economy in our line. The interest in scientific management then will lie in demonstrating there is a practical and assured profit or ultimate gain for all concerned in it.

With this in view it gives me pleasure to present to you a scheme of management we have worked out, which may suggest some new ideas to you in your several lines, although being far from complete.

I will take up Forestry first as being both an integral part of a properly conducted industry and because applicable also to the larger interests of State and Country.

Given a tract of untouched timberland to start with, the first duty is to secure an expert and determine its condition as to growth and value and prearrange a plan for its care in order that the industry or owner, with the broadest view of the future, may reap the greatest benefit therefrom. The Forester will explore it to report on the place, area, access to, kind and amount of timber, its condition and rate of growth, what shall be taken, what left. He will survey and map it carefully to present this information in a concise way, usually by means of contour line maps, painted or ruled, to show species. He will make a plan to protect the land in the future from decay, wind throw and insect depredations by judicious cuttings, and from fire risk by the establishment of watchmen on the tops of the mountains, the use of patrol, the building of trails and telephones, installing fire fighting apparatus at needed points, and in a broader way cooperating with his neighbors and the State along these lines. Finally he will determine lengths of haul, condition of forest floor, size and location of drivable streams, lengths of drive and all surrounding and contributory conditions, and report on the future supply that by following various methods of operation can be expected from the area. Subsequently he can map and report on operation and revise his work to date.

The next step is to consult a Forest Engineer, who studies out the best situation for camps, the capacity of streams, the cheapest and most efficient manner of building tote roads, hauling roads, railroads, cutting timber, improving streams, and the many ways of carrying out the forester's suggestions, using modern instruments such as steam, dynamite and telephones.

Then establish a District Manager, who makes out a budget of operation, creates a staff of helpers to carry out the work, operates or sublets the

cutting, driving and shipping, purchases or sells, audits reports and accounts, and is the local head.

He may call to his assistance on the staff, in proportion to the size, distance or importance of the operation: an Inspector to save waste in cutting, who reports weekly on special blanks; a Head Scaler, who reports mistakes in scaling and marking; a Telephone man to keep up the means of communication; a Cost Accountant, who installs a minute but simple set of camp and storehouse books and figures out and returns to him prompt and reliable data, a Machinery Expert, who sets up and looks after Logging Engines, Steam Tow Boats and Log Haulers; a Traffic Manager, who prearranges for the securing of good car service from the railroads; a Purchasing Agent, who saves by combining orders, watching markets, and obtaining discounts; a Veterinary, to take charge of the horses; a Statistician, who gathers and tabulates information in a logical way for the Manager's guidance in the future.

These and some others as members of a staff each concentrate on some detail and in the end save more than their maintenance, and by cooperation form an effective working body.

In the direction and organization of this staff I wish to present to you a system which we have worked out on the side of the management wholly. The labor side of Scientific Management which calls for task setting and a bonus we have not taken up as yet, being uncertain as to its advantages. Whether there is any analogy between the shop and the camp in the woods is a question.

I doubt if it is always best to set wages by the result of processes, or that tangible results always represent the true value received from the service. The human and psychological side often plays strange pranks with logic and justice should be often largely tempered with mercy. It is possible, however, that a task and bonus system may be worked out for a part of the labor at least, but this has not been done as yet.

There are three lines of thought, which follow each other in natural sequence in considering any enterprise.

First:—Forming a plan of what is to be done. Legislative, which we call the Budget.

Second:—The actual performance and recording of the work. Executive, which can be improved.

Third:—The experience or data gathered from analysis or synthesis of record to form judgment. Judicial, which we call Statistic.

Such judgment joined with courage, imagination and capital, leads to the forming of another plan.

The Periodic, Systematic and orderly handling of the first and third of these, the Budget and Statistic, we present in a certain method or plan as Scientific Management.

A book for the first of these is made by the General Manager at stated periods in advance of the performance, which contains a skeleton outline of the estimate in every department on all important subjects for the advice and guidance of the District Manager and those of his staff who are particularly interested in such department. This skeleton outline is routed down through and

filled in by the staff, each contributing something to the consensus of experience, and returned by certain times and seasons to the General Manager. It is then revised and becomes the Budget for the coming operation.

The third, the Statistic Book, is kept in the general office and necessary reports and extracts from it are sent out to the members of the staff by the statistician whenever needed.

The object of the Budget is to reduce loose plans or opinion down to a scientific guess, and will result in much saving due to the adjustments which are perfected between the different parts of the business; the drawing together of the staff in united effort, creating "esprit de corps," and assuring the power of concentrated action.

In the Second or Executive department an accounting system should be perfected for gathering of absolutely accurate, far reaching and prompt reports, so that the General Manager can have at least once a month the cost of every detail however small.

The gathering of statistics should be carried on at all times, and all reports and records should be filed away and condensed so as to be subject to easy access.

In working out a skeleton plan for a Budget, an Accounting, and a Statistic Book one general plan should be followed for the purpose of comparison; the districts, departments and headings necessarily varying according to the character of the business, but a general formula of elastic and free interpretation may be used for all headings under which answers are desired under the ten questions as to Time; Amount; Kind; Labor; Equipment; Measurement; Records and Accounting; Price, Costs and Payments; Conditions; Accessories and Incidentals.

The skeleton plan given herewith has been made to suit the particular needs of our business, and should be modified and added to in many ways to meet other conditions, but we present it as an example and illustration of the present working system under which we operate.

PLAN FOR BUDGETS

PLAN FOR BUDGETS

General Budgets	District Budgets	Sub-Headings (Under each District)	Formula (Under every Sub-Head)
Log. I } " II } For Logging " III } Four Companies " IV }	No. 1-2-3 } " 1-2-3-4-5 } Two to seven " 1-2 } Districts under " 1-2-3-4-5-6-7 } each company	1. Offices & Storehouses 2. Mills 3. Railroads 4. Company Camps & Jobbers Camps 5. Horses 6. Telephones 7. Farms 8. Estimating, Surveying & Mapping 9. Cutting & Inspection 10. Fire Protection 11. Sales & Purchases, Stumpage Etc. 12. Hardwood Operation 13. Car Requirements & Freight 14. Taxes 15. Insurance 16. Rents 17. Improvements	Pl. Place A. Amount K. Kind T. Time L. Labor E. Equipment M. Measurement Pr. Price, Payment & C. Records & Accounting S. Specifications, Conditions, Accessories, Etc.
Dv. I } " II } For Driving Same " III } Four Companies " IV }	No. 1-2 } " 1-2-3-4 } Two to five " 1-2 } Rivers or Regions " 1-2-3-4-5 } under each company	(Under each River or Region) 1. Offices & Storehouses 2. Camps 3. Steam boats 4. Horses 5. Telephones 6. Taxes 7. Insurance 8. Improvements	(Under every Sub-Head) Pl. A. K. T. L. E. M. Pr. C. S.

STAFF & ROUTING

STAFF	Log. I			Log. II					Log. III		Log. IV							Dv. I		Dv. II				Dv. III		Dv. IV				
	Division			Division					Division		Division							Division		Division				Division		Division				
	1	2	3	1	2	3	4	5	1	2	1	2	3	4	5	6	7	1	2	1	2	3	4	1	2	1	2	3	4	5
General Manager	1/1	1/1	2/1	3/1	3/1	3/1	3/1	3/1	4/15	4/15	3/15	3/15	3/15	3/15	3/15	3/15	3/15	1/1	1/1	2/1	2/1	2/1	2/1	2/15	2/15	3/1	3/1	3/1	3/1	3/1
District Managers																														
No. 1	x								x		x							x		x				x	x	x				
" 2		x										x							x											
" 3			x										x																	
" 4														x																
" 5																x														
" 6																	x													
" 7																														
District Accountants																														
No. 1	x								x		x							x		x				x	x	x				
" 2		x										x							x											
" 3			x										x																	
" 4														x																
" 5																x														
" 6																	x													
" 7																														
District Foresters																														
No. 1	x								x		x																			
" 2		x										x																		
" 3			x										x																	
" 4														x																
" 5																x														
" 6																	x													
" 7																														
District Inspectors																														
No. 1	x								x		x																			
" 2		x										x																		
" 3			x										x																	
" 4														x																
" 5																x														
" 6																	x													
" 7																														
District Scalars																														
No. 1	x								x		x																			
" 2		x										x																		
" 3			x										x																	
" 4														x																
" 5																x														
" 6																	x													
" 7																														
Purchasing Agents	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Engineers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Traffic Manager	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Financial Agent	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Routed by x

WOOD AND ITS USES

BY D. P. BROWN.

This subject being so broad that it would be impossible for me to more than mention the numerous uses to which wood is being put to to-day, I shall discuss principally those processes which you as furnishers of the raw material are most interested in, and in describing these processes I shall consider only the kinds of wood which are to be found in the northern part of New England and in the Province of Quebec.

WOOD FIBRE.

First and most important of all is the pulp industry as applied in the manufacture of sulphite, sulphate, ground wood and soda pulps. For these different processes the soft woods with the exception of certain hardwoods for the soda pulp are the only woods suitable. The reason for this is that most pulps require a fairly long fibre and the fibre of the hardwoods are almost invariably short. Wood is composed of two principal constituents, cellulose and lignin. The cellulose representing the fibre and the lignin the cement which holds the fibre together. In general it is found that the harder the wood the greater the lignin and the less its cellulose content. Not only does the composition vary with different species but the composition of a certain kind of wood varies under different conditions. For instance, spruce growing at low altitudes in southern latitudes will test about 45 per cent. cellulose while the same kind of spruce if grown in high altitudes in northern latitudes may contain as high as 54 per cent. cellulose.

The following table gives a fair average of the per cent. of cellulose and nature of fibre of a few kinds of the most important woods:

KIND OF WOOD	PER CENT. OF CELLULOSE	NATURE OF FIBRE
Beech	38-40 per cent.	Short
Birch	42-43 " "	Short
Hemlock	40-41 " "	Long (One of the longest)
Spruce	45-48 " "	Long " " "
Poplar	42-44 " "	Medium
Pine	39-45 " "	Long
Fir	38-43 " "	Long
Maple	38-41 " "	Short

BLACK SPRUCE.

From this it will be noted that the spruce is the most valuable of all woods both on account of the yield and because of the extra long fibre. Of the different kinds of spruce black is the most valuable owing to the firmness of the wood, the strength of the fibres, the uniform soundness and the great yield that can be obtained.

WHITE SPRUCE.

White spruce where it obtains its best growth in the southern part of Canada and the extreme north of New England yields next in value, while the red spruce which is the most common specie of the Androscoggin is the coarsest of all spruces and has the least yield.

Taking up the processes separately I shall consider them under the two heads of Raw Material and Manufacture.

WOOD FOR SULPHITE.

Kinds of wood suitable are spruce, balsam fir and hemlock in order named. Although hemlock is a better wood than fir when cooked separately, I mention it last owing to the fact that it is not valuable when mixed with the other two species, in fact it is extremely harmful and should be kept out of the pulp wood shipped to a bleached sulphite mill making a high grade pulp for finer grades of paper. The reason for this is that it requires more bleach and when put in even in small quantities necessitates the overbleaching of the other pulp. If an amount for the spruce and fir alone is put in, the hemlock fibre will throw off the bleach with the result that an inferior grade of sulphite is produced. This point cannot be too strongly emphasized. It does not however make any material difference where the sulphite is manufactured for the lower grades of news or manilla where an enduring white color is not required.

BALSAM FIR.

The effect of fir is to decrease the yield and to make the pulp weaker. A small amount of not over 30 per cent. can be used to good advantage, but a large per cent. makes the pulp too soft and is also apt to cause trouble with pitch gumming up the wires on the paper machines, causing frequent shut downs to clean off the wires.

SAP WOOD.

The best fibre of any wood is obtained from the sap wood and the poorest as regards strength and yield from the heart. The reason for this being that the sap wood contains less lignin and more cellulose, whereas the proportion in the heart wood is considerably increased, this being evidenced by the heart wood being more brittle. For this reason it might be well to note in passing that slabs from a saw mill are especially valuable for making chips and it has been found in actual practice where about 25 per cent. of the wood used came from slabs and edgings that both the yield of pulp from the digesters was increased and the quantity of wood required per ton decreased materially. The only objection to using slabs has been in the trouble found in getting an even chip but this can be overcome by a special chipper and feed roll.

SIZE OF WOOD.

In discussing the size of the wood the most advantageous length to be handled is four foot. This requires no further sawing at the mill except where a friction barking system is used when the wood is sawn into 2 foot blocks. Four foot is the largest size practical to use in the chippers, it makes a better and more uniform chip than 2 foot wood and makes less screenings for the machine

room. The best diameter of pulp logs is 10 inches to 12 inches, as most chippers are designed for about this size of wood. Wood larger than this requires extra labor for splitting and wood smaller decreases the capacity of the chippers. There is, where a system of friction barkers is used, or where peeled alone is supplied, really no limit to the small size of the diameter at the top end. Owing, however, to the general knotty condition of the tops and the difficulty of getting even chips, except in specially designed chippers, it does not pay to use logs under four inches at the top end. Where the disc knife barkers are used wood should not be cut under 5 inches at the top end owing to the fact that when wood of a smaller diameter is barked there is little or nothing left.

SOUNDNESS.

Considering the question of the condition of the wood, first in regard to soundness, it should be remembered in general that rotten wood yields no cellulose and is simply carried through the process as a dead weight. For that reason it is important not to permit the loading or shipping of cull wood contrary to the common theory that if the scaler throws it out there is no loss. On the other hand there is a distinct loss at the mill, for there it is either thrown out at an extra expense in handling, or is allowed to go through, taking the place of more valuable wood. Where possible, wood, especially rough wood, should be used the year it is cut, for as the wood lays over a continual oxidizing process is going on which tends to weaken the fibre. In no case should rough wood be allowed to lay out over two years, as then the loss from decayed fibre is excessive.

STRAIGHTNESS.

The straightness of the wood is not an important part as only a small quantity of our woods are very crooked. In the knife barkers where the wood is trimmed against a flat surface some extra loss is occasioned. Also a crooked log will not chip well and cause waste in the cooking process, largely because of the impossibility of keeping the logs tight against the disc. This produces uneven chips and as a consequence in the cooking process the shorter chips will become penetrated with the acid quicker and therefore cook somewhat ahead of the longer ones.

KNOTS.

The best pulp is produced from wood that is free from knots, and much of the fine dirt in pulp comes from the so-called knot linings. Where the wood is barked with knife barkers poorly trimmed tops are awkward to handle and hard on the knives, and in the friction system the bark does not rub off easily as the protruding knots protect it.

SEAMS.

Seams in wood are apt to cause dirt unless cleaned by hand and this is expensive. It is especially desirable to have clean wood in this process where specks in the pulp greatly hurt its quality. This is particularly true in the winter when the frozen wood makes it difficult to wash of any dirt.

INNER BARK.

Peeled wood should be at all times thoroughly peeled and the so called inner bark removed, for if it is allowed to go to the digesters it will make a

large amount of dirt. Ice is objectionable as it must be melted off the wood to insure proper inspection before going to the chippers.

BURNT WOOD.

Burnt wood has to be barked by knife barkers clean of all checks or stains and there is consequently an excessive waste on this wood. It should never be accepted in purchased wood. Should any get through the wood room not properly cleaned it makes dirt in the pulp. As far as the fibre is concerned the same rules apply to it as to wood that is cut and piled. In both cases the growth of the wood is stopped from some source outside of the tree itself and the fibres are not affected.

DEAD TREES.

In the case, however, of so-called dry trees it is the fibres which are affected causing the tree to die. This wood may be suitable for lumber if not decayed but not for pulp as the strength of the cellulose is gone.

SULPHITE MANUFACTURING.

Taking up the process of manufacture, the wood is either barked first, if rough, or if peeled passed directly to the wood room after having been carefully inspected for bark, faulty seams, dirt, etc., which must be removed by hand at a considerable expense. In the wood room it goes to the chippers where cross sections of the wood, generally one inch thick, are cut off. These sections break up partially when thrown from the chippers, and are then conveyed generally to the crushers which break them up into small chips about an inch long by 3-4 in. wide by 3-8 in. thick. The chips then pass over screens where the uneven chips are removed and returned to a rechipper. The sawdust from the chippers and crushers is removed from under the screens and generally sent to the boiler room for fuel. The chips then pass to the digesters where they are mixed with the cooking acid and steam under pressure for a period varying from nine to twelve hours depending on the quality of pulp required and the strength of the acid. This acid is produced by burning ordinary brimstone converting it into sulphur dioxide. This usually passes through a milk of lime solution where the sulphurous acid unites with the lime to form the soluble bisulphide of calcium and magnesium and a portion of it remains present as free sulphurous acid. The chemical action on the wood is to unite with the lignin leaving a pulp which is practically a pure cellulose. The physical characteristics are a soft pulp of fairly long fibre which bleaches very rapidly with a small quantity of bleach. After the cook is completed, which is determined by the color, smell and test of the acid, the pulp is blown into a large tank or pit with a perforated bottom through which the waste water passes. While in this pit the pulp is flushed with fresh water and thoroughly washed for a period of about four hours. From the pits it is sluiced to a storage tank and from there to the screens where the coarser stock is screened, the fine fibres passing through the screen plates and from there to the wet machines. The rejected fibre is usually ground fine and sent to other wet machines. This can be used for wrapping paper. Where bleached sulphite is used the bleach is applied in the beaters before going to the wet machines.

The main direct sources of waste from wood itself, not considering the cooking liquors, are: First, the bark where rough wood is used. Second, the sawdust from slashers where long logs are cut up and the sawdust from the wood room. Third, the fibres which escape in the waste waters. In most mills the first two waste products are used merely as fuel and carried direct to the boilers. In some plants where the bark is water soaked it first goes to presses where the water is partially removed. Certain products can be made from this waste which will be mentioned later on. The usual method of recovering the pulp in the waste water is by putting all of the water before it leaves the mill through specially designed save-alls which screen out the escaped fibres.

The uses for unbleached sulphite are as a constituent of news, cheap printings, packing papers, etc. And for bleached: printings, writings, book papers, lithographes, in short most of the higher grade papers.

GROUND WOOD PULP MANUFACTURING.

The Ground Wood process is perhaps the one next of interest to us. This is the simplest of all, for here the wood is merely ground up and no attempt is made to remove the lignin. The same woods can be used as in the sulphite.

PINE AND HEMLOCK.

The pines are objectionable for news owing to their pitchy nature which makes dirt in the pulp and causes trouble on the screens of the paper machines. A small amount of hemlock can be used in this process.

FIR.

Too much fir is to be avoided, particularly when not dry, as it produces a very soft and powdery pulp which is lacking in the required strength. Twenty per cent. is considered the limit of safety for a good product.

SIZE.

The sizes required are practically the same, grinder chambers being capable of receiving any size up to 13 inches. The wood should be sound and straight as it has to be split when it is at all crooked in order to get into the chambers, free from knots if possible, free from seams, and clean.

PROCESS.

The process is the forcing by hydraulic pressure of blocks of wood from 8 inches to 16 inches against revolving stones which tear the fibres of the wood away from the logs. The pulp so formed is then washed away, screened and run out on the next wet machine.

The pulp is used as a mixture with other pulps for news, cheap printing, wrappings, etc., but for no high grade paper of enduring quality or strength.

SULPHATE PULP WOODS.

Before discussing the sulphate process in detail two points should be emphasized.

STRENGTH.

First: The most important thing to be obtained is a strong pulp, and therefore, wood of long fibre is especially suitable.

Second: From the nature of the uses to which this pulp is put, namely: wrapping paper, bags and other papers wherein strength is the main thing required it is not necessary to expect the same degree of cleanliness as in wood that is required in the processes used for the production of a higher grade of paper. The brown color also of the pulp and the impossibility of bleaching it without loss in strength covers up defects which would be easily detected in a white sheet of paper.

KINDS.

Spruce again is the most valuable wood, while hemlock, pines and balsam fir follow in the order named. Fir should not be used in any great quantity and, although I have no absolute data on the subject, I am of the opinion that 10 per cent. would be an outside limit of safety for maintaining a high grade sulphate pulp.

BARK.

The requirements for the condition of the wood are not so stringent as in the case of most of the other processes. In some mills the bark is not removed at all but is allowed to go through the process. The advantages in this are the saving in cost of installation and operating of a barking plant and added yield which may be obtained from the bark. The main argument against this practice is on the ground of quality, for it is impossible even with the most careful screening and washing to get rid of all of the effects of the bark which are bound to show up in the paper and to affect its appearance. Again in the cost of the operation only a small part of the bark will produce fibre and the balance which is carried through takes up the room of good chips.

In case the wood, if not at least partially river cleaned, is put in rough, ten per cent. of that which goes into the digesters will then be bark. This large amount must undoubtedly lessen the strength of the pulp produced. Where the bark is removed it is not necessary to be very particular and a small proportion of partially barked wood can be put in without affecting the quality of the pulp. Seams do not have to be cleaned and it is not necessary to pick out the faulty pieces before they are put in the chippers. It is quite essential for the best results to have only the soundest of wood, when it is remembered the main thing striven for is a strong pulp.

DRY WOOD.

In the sulphite process little is gained in saving chemicals and steam by using dry wood instead of green wood, owing to the fact that green wood is more easily acted upon by this acid process, but in the sulphate, and the soda process also, the best results are claimed from dry well seasoned wood, as thereby disadvantageous diluting of the digester liquor is prevented, increasing the percentage of recovery of chemicals, and the highest yield of fibre from the wood is obtained.

SULPHATE PULP MANUFACTURING.

Taking up the manufacture, the wood is chipped up in the wood room, from there going to the digesters where it is cooked under 90 pounds pressure with a liquor containing, roughly, two-thirds caustic soda and one-third sodium sulphide. The time of cooking varies from five to ten hours depending on method of steam, strength of liquor, etc. The feature to note here is that the sulphide in the liquor has a less violent action on the wood than the sulphite

or pure caustic of the soda process, and therefore does not destroy as much of the lignen. This makes the fibre long and gives a better yield from a cord of wood. From the digester the pulp is blown to tanks where the liquor is washed out and returned to the so-called recovery plant where a large per cent. of it is reduced. The pulp goes direct from this room to the machine room where it is first screened and then run out on wet machines, it being in a suitable condition to ship or send to the paper mill.

The sources of direct loss are similar to those of the sulphite mill except that in some mills the sawdust from the wood room is allowed to go through with the chips. The reason for this is that the dirt which is the objectionable feature for the sulphite does not show up in the brown sulphate. Much of this sawdust perhaps goes through as a carrier but undoubtedly some of it yields good fibre.

Sulphate is used in the manufacture of wrapping, bags, leather and all papers where strength and durability alone are required.

SODA PULP MANUFACTURING.

The soda process I shall not take time to go into in any detail. It is much similar to the sulphate in process both being alkaline reactions except that pure caustic soda is used and the product obtained is a light, soft, easily bleached pulp which has little strength and is used for inferior strength wrappers, soft, bulky papers as blottings, magazines, soft printings, etc., and as a constituent of writings, printings, etc.

The same woods can be used except pine where bleached pulp is made, and in addition poplar and birch are used. The kind of wood used depends, leaving out the question of availability and cost, upon the grade of paper that the pulp is furnished for. For instance a mill making pulp for brown wrapping paper of certain strength will not use same wood as a mill manufacturing well bleached book or writing paper.

POPLAR.

The former mill would naturally use soft wood as spruce or fir for obtaining a pulp with a fibre of certain length and strength, the latter would rather use poplar as this wood gives an easier bleachable pulp and at the same time a fibre suitable for that kind of paper. In most cases a mixture of different kinds of wood is used but a separating of hardwood from softwood is always to be recommended.

Saw Mill.

WOODS.

The soft woods commonly used in this manufacture are white pine, spruce, fir, hemlock, Norway pine, banksian pine in Canada and cedar. The sizes required in the different species vary as to length and diameter.

DIAMETER.

For pine it is general practice to cut nothing less than 10 foot long and 8 inches at the top end. However, where pine is being sawn in connection with a sulphate or soda pulp mill or a finishing mill using small stock 6 inch tops are practical.

To saw to the best advantage nothing less than 8 inches on spruce, fir or hemlock or banksian pine should be used where it is possible to put the smaller sizes into pulp wood. Six inch, however, even on 13 foot logs can be sawn to good advantage where it can be split and sent to a resaw to be made into narrow width boards without retarding the production of the mill. Cedar should not be less than 6 inches at the top end.

LENGTH.

On the question of length, the ideal condition would be to cut each tree to advantage in the woods the limit being the length of bed of mill which should be at least 40 feet for the best results. Then by having the sawyer cut every log to its best advantage again at the mill undoubtedly there would be the least waste, the most efficient sawing, and the best yield obtained. This, however, is not practical to do for several reasons namely, the difficulties encountered in the woods, on the drives and in the requirements of the final markets for special length. One thing of great importance should be made note of, that is the careful measurement of logs cut for a certain specified length. For instance in cutting 13 foot logs for the English market allowance of at least four inches should be made for board ends where the timber is sound, and where the butts or tops are defective extra allowance should be made or the ends sawn off to sound timber.

In the case of long logs which must be cut again at the mill six inches should be allowed. Timber is sold on even feet and carelessness in measuring lengths in the woods means loss of a few inches on every log falling short of required length. The length should be reckoned from the top of scarf when cut with an axe.

BUTTS.

The most valuable part of the log when sound is the butt cut for here the clears are found. The logs should be sound and especial care exercised in the case of fir, the pines and hemlocks for unseen defects. Spruce, pine and cedar butts which are partially defective can be used provided the rot does not run up into the log too far, but fir should be always made sound. Large hemlocks should be culled with especial care for in this latitude it soon becomes dozy and the smaller trees are invariably the soundest.

CROOKS.

Crooked logs are hard to handle in the mill and wasteful, and trees should be where possible cut in the crook in woods regardless of length.

TOPS.

Knotty tops are hard on the saws and it pays to have the logs well trimmed.

DIRT.

Dirt on the bark also wears on the saws especially in late fall and winter when the ice holds it on the log.

SPIKES.

One cause of serious trouble which is not always looked after is the putting of spikes and nails in the logs which cannot be detected at the mill.

When the saw strikes a hidden spike not only is the saw damaged causing a temporary shut down, but there is great danger of the saw breaking and injuring the men near it. This trouble could be greatly lessened by the men in charge of handling the wood using a little more diligence. Old cribs, piers, wharves, rafts, bridges, etc., should not be allowed to go into the drive unless carefully inspected and it should be understood on the drive that logs with spikes in them are to be taken out at any cost. Some system of offering prizes for the capture of such logs might be well worth while especially on this river.

FROZEN WOOD.

Frozen wood saws hard increasing the cost of saw repairs. Very often dry wood which is worthless comes to mills and in cutting logs from dry trees special care should be taken to see that wood inside the sap is not cracked or checked. Ten inches of sound wood inside the sap is a good limit of safety.

AMOUNT OF WASTE.

The manufacture of the wood I will not take time to describe as you are all familiar with it. What becomes of the log is, however, of interest and in general a fair average would be as follows:

Timber	50 per cent.
Sawdust	30 per cent.
Slabs, edgings and board ends	20 per cent.

100 per cent.

Of course these results vary greatly depending on the use of a band saw or circular, the diameter of the logs sawn and the size of the lumber made, etc. For instance in a mill sawing logs of 8½ inches diameter 13 feet long into 1¼ inch boards the following results were obtained:

Timber	42.6 per cent.
Sawdust	26.4 per cent.
Slabs, edgings and board ends	31.0 per cent.

100 per cent.

Here the per cent. of lumber was low and slabs high owing to the fact that this mill was purposely slabbing heavy as the waste went into chips. From this table it will be noted that where only half of the log gets into lumber the problem is to utilize the waste. Where a mill is run in conjunction with a pulp mill the sawdust, bark and board ends under 12 inches are used as fuel either direct under the boilers or as in a gas producer, and the slabs and edgings are made into chips.

USES OF WASTE.

In this connection it might be well to mention some of the uses to which saw mill waste can be put to:

All barks contain a certain amount of tannic acid which is used in the process of tanning leather, and in the so-called Dutch process of making paint. The tannic acid in bark of wood which has lain in the river for a long time, however, has been largely dissolved and for that reason is not satisfactory.

Henlock bark has the largest yield of the soft woods. It should be peeled in the woods and piled where it will dry as speedily as possible.

The uses to which sawdust and waste wood are put are many and I will name only some of the principal ones:

- (1) As a packing material.
- (2) Dynamite. As an absorbent for nitro glycerine.
- (3) Mixed with rosin for common fire lighters.
- (4) Briquettes. Made by mixing concentrated waste liquors from the sulphate process, used as fuel or for distillation in manufacture of wood spirits, acetic acid and charcoal.

(5) Oxalic acid is made under a caustic soda and caustic potash treatment. This acid is used for dyeing purposes and the formation of formaldehyde.

(6) Glucose. By an acid treatment, this being used for syrups (corn syrups included) and an alcohol can again be fermented from this from which the finest whiskey is produced.

These are only a part of the uses to which sawdust is put, so the possibilities along this line can be readily seen.

Where hardwood or soft woods are sawn the waste can be used for fuel or in the distillation of wood alcohol. From this process charcoal, wood alcohol containing acetone, acetate of lime, tar and wood oils are produced.

CEDAR.

In passing it might be well to note that cedar besides being made into shingles in the saw mill is valuable for other purposes: For ties, mentioned later, telegraph and telephone poles, fence posts and in the manufacture of boats. Its principal characteristic is lightness and ability to stand weathering.

One Universal market for certain woods is in the sale of railroad ties.

RAILROAD TIES.

The following are the woods most commonly used for this purpose together with the average life (when unkyanized)

- Cedar, 9 years.
- White Oak, 7 years.
- Chestnut, 7 years.
- White Pine, 5 years.
- Banksian Pine, 7 years.

When kyanized the life is increased about 30 per cent. It might be noted that the plentiful Banksian Pine of Quebec is a serviceable and cheap wood for ties. Owing to facility with which it can be cut and to its extremely pitchy nature which retards the decay of the wood.

The sizes used are from 8 to 9 foot lengths from 6 to 9 inch face and six to nine inches thick, depending what lines used on. When squared 1 inch is added on the face. Uniformly sound logs are required.

HARD WOODS.

The hardwoods most commonly used for the manufacture of rough lumber, are yellow birch, rock maple and beech, also elm, oak, ash and white

maple in lesser quantities. Of these first three birch is the most valuable largely owing to the good finish obtained. Rock maple is stronger and more lasting but does not bring as high a price on the market. Beech, probably for the reason that it is more apt to be dozy, ranks third although it makes excellent flooring.

GRADING LOGS

In furnishing wood for this manufacture too much care cannot be taken in selecting only the sound wood. In the first place there is an excessive amount of waste even in sound logs due to the logs often being crooked and impossible to square up without making a large amount of slabs. Secondly by nature most hardwoods are more inclined to unsoundness than the soft woods. Thirdly the unseen defects are greater and the heart rots are more common. Much of the money lost in this business is done right in the woods in not culling out logs of an inferior quality which can only be used for the lower grades and in many cases have to be thrown out entirely at the mill. Under present market conditions the margin of profit in this business is so small that the greatest care and judgment should be used in the wood cut.

LENGTHS.

The logs should be cut in even lengths allowing at least two inches for board ends.

DIAMETERS.

For top diameter eight inches is the minimum

HEARTS

Contrary to the soft woods the heart wood when sound is the most valuable part of the log on birch, beech and maple. This is on account of the better finish that can be obtained.

The logs should be free from large limbs, fairly straight, free from seams as they generally mean hidden decay and well cleaned from dirt. Frozen hardwood is very hard on saws and the best lumber can be made in the summer.

EARLY DECAY

Hardwood should not be allowed to lay over a year as it checks badly and is apt to become dozy.

OTHER PRODUCTS

The final products from hardwoods besides lumber are too numerous to even mention in total. The principal hardwood products from round logs in this country are briefly:

PRODUCTS	WOODS MADE FROM	REMARKS:
Bobbins	White and yellow Birch, Rock Maple and Beech.	Six inch wood can be used to good advantage and partially defective wood can be worked.

Squares	White and yellow Birch, Rock and White Maple and Beech.	Outside of long lumber this industry is the greatest user of hardwood as the product made can be used for so many different finished articles. The function of this industry being to reduce the wood to workable condition. The quality required depends on the use to which the squares are put. Squares for spools are made out of white birch alone on account of the smoothness with which this wood can be turned. Dowels, clothespins, novelty stock, chair stock, and handles are some of the principal products made from squares. In this manufacture most of the wood can be worked.
Tooth Picks	White Birch and Poplar.	The best quality only can be used. Birch can have only small heart stains large enough to hold logs while they are turned. Poplar must be sound and free from stain and knots. Tops not less than 8 inches.
Veneers:	Yellow Birch, Rock Maple, Beech, Oak and Basswood.	Logs have to be free from knots, 10 inches at top end and heart sound.
Excelsior:	Basswood and Poplar.	Spruce, balsam and willow or any wood of light high color tough fibre can be used but the best results are obtained from basswood and poplar. This is generally cut 4 feet 5 inches top peeled and seasoned if possible.

In addition the other principal woods not mentioned are:

ASH:	Used for products requiring toughness and pliability such as handles of all description, carriage bodies, car works, crutches, etc., where toughness and strength are important.
HICKORY:	Carriage parts, certain handles, etc.
ALDERS:	Has exclusive use in the form of charcoal in the manufacture of high grade black powder.

The few remaining species occur in such small quantities as to be not worth taking time to discuss in this paper.



*Xerxes F. Wardwell
1868-1909

O. J. Condon
1869-date

*Horace P. Frost
1868-1912

*L. C. Beattie
1868-1907

Thos. J. Tracy
1872-date

GOVERNMENT, SEIGINORY AND PATENTED LANDS IN CANADA

BY H. BRUCE FLETCHER

Government, Crown or Limit Lands are those set aside by the Provincial Government, either for direct sale of the cutting rights for the manufacture within the Dominion of the lumber or pulpwood thereon, or to be used as payment for assistance granted by the Government, principally to Railway enterprises, as voted by the Legislature, under the heading of Subsidy Lands. The wood from these lands must be manufactured in Canada, which prohibits the wood under this heading from being manufactured into either pulp or paper outside of Canada. Licenses to cut from Limit land may be purchased when available at an annual ground rental of \$5.00 per square mile, and an additional charge for each cord of wood, thousand feet of lumber, or other product cut.

SEIGINORY LANDS.

These are situated principally on the shores of the St. Lawrence, some above, but largely below the city of Quebec. They were first granted by the King of France to certain of his favored subjects who came out to what was then known as New France, during the French regime. When the British in 1759 took Quebec, no changes were made in the ownership of lands granted under the French rule. The Seigneurs, as do their heirs and assigns at the presents time, held their grants or as they are called "Seigniories" outright, free from any license, rental or other charge. The wood therefore cut on these lands is governed by the same laws covering wood cut on privately owned lands, and is to every intent and purpose the same as Freehold land.

SETTLERS' LOTS.

These are granted by the Government in territories set aside for colonization purposes to Settlers, upon the payment of a nominal charge of about sixty cents per acre, payable in five annual installments, with interest at six per cent., and upon making an affidavit to the effect that they wish to acquire the lot for clearing and cultivating for their own personal benefit, that any lot or lots already held by the applicant are at least one half under cultivation, that it is not being acquired solely for the purpose of cutting the timber thereon for sale, or having it cut by others, and that the lot is unoccupied and unimproved. These grants are of 100 acres. In case of a lot consisting of more than 100 acres, the Patents must first be secured for the 100 acres by the necessary work, as laid down in the Government Regulations, being performed, then the residue or the acreage in excess of the 100 may be treated in the same way, and additional Patent

secured therefor. The conditions for securing the Patent for lots secured previous to 1909 are that 10 per cent., (and after 1900, 15 per cent.) of the acreage must be cleared within five years, and have the same under good cultivation, that the settler within eighteen months must build a house of at least 16x20 and reside in it until the issue of the Patent. At the expiry of the five years the settler must have on the lot a barn of at least 20x25, including a stable. Three acres of the cultivated portion must be fit for ploughing. No timber can be cut before the Patent is issued except for clearing, fuel, buildings, etc., and if sold must be manufactured in Canada. No transfer of rights is permitted within these five years. When this work has been done to the satisfaction of the Government or Crown Lands Agent, who inspects the work, a Certificate, known as a Patent, is issued in the name of the settler, which gives him a clear title to the lot, or residue of a lot, as the case may be, and he may then do as he sees fit with it thereafter. The lot then may be classed as Freehold or, as it is known, a Patented Lot. No person may secure a Patent for more than 300 acres, unless the lot or lots have been secured by judicial sale, sale for municipal or school taxes, or by succession without a will.

COUPE DE BOIS.

In buying the cutting rights, or as they are known in Canada, the "Coupe de Bois," on lots said to be Patented, or in buying them outright, that is, land and all other rights, it is first necessary to have tangible proof that the Patents have been issued and that they are legally held by the Vendor, then to ascertain, in cases where the Vendors have not secured the Patents themselves, but own the lots by purchase or otherwise, that the titles are good in every respect, that is starting from the issuing of the Patent, down through all intermediate holders to the prospective seller. In "Outright" purchases the Patent itself must be secured, or if it has been lost, a duplicate must be obtained from the Crown Lands Department. In the purchase of the cut only the patent may sometimes be secured, but in most cases the holder of the lot declines to allow it out of his possession. In all cases of purchases, under either heading, the deed must be registered at the Division Registry Office against each lot separately. As, according to the Law, with the few exceptions already mentioned, Patents can not be secured by one party for more than 300 acres. Unpatented lots have little value for pulpwood purposes to be exported. In regard to the conditions under which a Patent is obtained, a good deal is left to the discretion of the Minister and his agents, and very often the conditions can be modified, and the Patent secured in much shorter time.

FREEHOLD LANDS.

Freehold lands or lands held in fee simple, are those on which there are no restrictions other than possibly a reservation of the mining rights, and no charges other than taxes. These lands are purchased originally from the Crown and the owner is free to do as he wishes with the lumber, pulpwood, or other product. The wood from these lands can be exported direct from the stump. Good Freehold lands are the most desirable and most sought after, and are therefore the hardest to secure,

To sum up the relation of the different classification of lands which we have just considered, we have seen that Seignior Land, Patented Lots and Freehold Land can be, generally speaking, considered together—as the pulpwood or other product cut on any one is governed by the same laws in each case—that is free to export out of the country, while the product from Government, Crown or Limit Land cannot be exported in the raw state. In the case of logs they must be manufactured into lumber, or other like product, and the pulpwood into either pulp or paper.

SPECIES, VALUE AND GROWTH OF TREES

BY JOHN F. HECK.

I will endeavor to furnish in this brief paper a few facts relative to the species of trees, their value and something of their growth.

TREES AT WORK.

In our daily duties the tree occupies all of our attention and activity, we greet him in the forest, in the river, on the cars and in the mill. As long as the sun shines and the rain falls he makes raw material for us and in a manner which does not require any expensive apparatus. In no other business is the product also a producer.

We speak of the millions that stand on a section of land, the thousands that are sluiced down through the booms and we walk through the woods and rejoice at the sight of a beautiful "four logger." Everything is ready made.

Let us open the door for a brief moment and catch a fleeting glance of the great laboratories of nature which make all of this possible.

We must discover, in a general way, how the tree lives, for trees are alive and must be considered as living and at work.

FERTILIZATION.

The first step in the growth of a tree takes place when the pollen grain, those masses of yellow powder which all of you have seen coming from spruce and pine trees in the Spring time, are carried by wind or insects to the female flower of a tree.

Trees have two kinds of flowers. Male and female. The male flower produces only the pollen grain, or male sex, the female flower organizes within its ovary, female cells.

The pollen grain in its voyage through the air falls upon the specially prepared receptacle of the female flower. This receptacle holds the pollen grain by means of sticky fluid. The pollen grain begins to grow down into the receptacle until it reaches the female cells and the process of fertilization takes place.

As a result of this fusion an embryo tree is formed, looking, in its first conception like the letter "Y." Around this embryo a hard case begins to grow, and when it is matured it falls off and is called a seed.

SEEDING.

Our little seed falls to the ground and is ready for germination. Now germination is merely an awakening process, for the little tree is already a reality within the seed, but needs certain external conditions, prominent among which are definite amounts of moisture, heat, air and soil.

PARTS OF A TREE

The three principle parts of a tree are the roots, stem and crown. The roots take up food materials from the soil, the stem transports them, and the crown digests the food.

ROOTS.

The first part to escape from the seed, is the root. It at once shows a responsive influence to the earth. When the stem tip extricates itself, it at once shows a responsive influence to the light.

CROWN.

The crown is of special interest, because here reproduction and digestion takes place, and also we can control the shape of a crown which in turn influences the product of the tree.

STEM.

The materials absorbed by the roots must be carried to the leaves. The transportation of the materials takes place in the stem, through the sap wood. For this reason the sap wood is always moist. The heartwood is dead wood. It does not assist in the production of food, but acts merely as a mechanical support.

TRANSPIRATION.

When the water, carrying the dissolved salts, reaches the leaves, all of the salts are retained, but only a portion of the water. A great deal more water enters the tree than is needed, and this excess water must be evaporated from the leaves.

The process of evaporating the water is called transpiration. When there is plenty of water on hand, the tree transpires freely; when there is a scarcity of water, the leaves have the power to check transpiration.

LEAVES.

The leaves are the stomach of the tree because they manufacture the food. All leaves are green. This leaf green has the phenomenal power of absorbing energy from the sun.

The leaf takes from the air carbon and oxygen, retains the carbon, and together with the water from the roots, recombines the elements in a new way, the first visible product of which is sugar and starch.

CAMBIUM.

This material is needed for the building up of cell wall, or wood. The food so manufactured must be distributed to the growing parts of the tree. It is then transformed into an extremely complex compound, called cambium.

This cambium is a thin layer of living substance lying between the bark and the wood of the tree. This living substance is capable of cell division, actual growth.

In the process of growth the inner cells of the cambium become wood and the outer cells remain cambium. Since the inner cells turn into wood and become hard, the march of the cambium is continuously outward, making diameter growth.

WOOD RINGS.

The annual ring is composed of two kinds of wood. The Spring wood and the summer wood. The Spring wood is light in color and the summer wood is dark.

In the Spring time when the first cells have been formed, they are immediately used for the conduction of water. In order to lift the water rapidly these cells have wide openings and thin walls.

In the summer time, while the living substance is still working, and there is plenty of digested food on hand and the demand for water is not so great, the cells then formed are thick walled. For this reason the summer wood of a tree is heavier and stronger than the Spring wood.

When the cool season sets in, cells growth is checked. The annual ring has been formed. This process of adding an annual ring will go on the next year and for every year that the tree lives.

The more leaves a tree carries the greater is its digestive capacity, the greater is the amount of wood formed.

TREES CONSIDERED COLLECTIVELY.

This is briefly the life history of an individual tree. While it is necessary to know something of the history of an individual tree, the object of our business is not a single tree, but acres of trees, a collection of trees to be considered as an organic whole; the result of evolution, of a relation between the components of the forest themselves, to the soil and to the climate. The behavior of trees under these new conditions brings about an entirely new train of results.

There are 500 species of trees in the United States, 70 of which furnish a product for the market.

STRUGGLE FOR EXISTENCE.

The abundance or scarcity of a tree, the locality in which it grows, size and rate of growth, are determined by the weapons with which the species arm themselves in the struggle for their existence.

Different species are adapted to live in different climates. The palms and broad-leaved evergreen trees are found in the tropics. In the middle latitudes the oaks, hickory, yellow poplars and chestnuts flourish, while in the northern latitudes the spruce, pine, aspens, and birches hold sway.

The meek species, those modest with reference to soil, neat and moisture, like the pine, have the advantage over the exacting species which require a fertile soil for their growth, the beech for instance.

Power of resistance to storms, frost, drouth, immunity from insects, rapidity of height growth, long life, each and every one of these factors will determine the supremacy of one species over another on the forest floor.

MOISTURE.

Heat and moisture determine the distribution of trees. A wet climate will produce a rich forest, a dry climate will produce stunted growth. This is splendidly illustrated in the forests of the West. Taking a cross section of the United States from the western coast to the State of Michigan, we find that the

moisture laden winds coming from the Pacific Ocean and passing in their easterly course over the Coast Range, Cascade, Blue and Rocky mountains, distribute their moisture only in the altitudes above the lowest gap over which they pass. The eastern sides of the ranges show very little forest and the low lands are praries and deserts.

SEEDING POWER.

There is a marked advantage in the character and dissemination of seeds. Species that have light seeds, such as pine, spruce and poplar, have the advantage over heavy seeded species like oak and hickory. The former are transported by the wind and the latter by birds and animals.

A birch tree which produces seed every year has the advantage of establishing itself over a tree which produces seed every five years, the spruce for instance.

The seed of the willow loses its power of germination within a few hours, while the seed of a black locust may lie dormant on the ground for years, only to be called to life by a surface fire.

NEED OF LIGHT.

Some species demand light, others demand shade. Shade demanding species like maple, hemlock, spruce and balsam, have a dense crown, the leaves run all along the branches, are able to function in the shade and the trees are able to live beneath the shade of other trees. The aspens and birches show by the very openness of their crowns that they want lots of light. They are unable to thrive beneath the shade of other trees.

SUCCESSION OF FORESTS.

Upon this classification of light depends chiefly what we so comonly see, the succession of forests.

When a tract is logged over, the aspens come in quickly and take complete possession of the ground. They have the advantage of being prolific seed producers, they want lots of sunshine in their youth and they are rapid growers. But if you look beneath the stands of these aspens you will find that the modest spruce has also established himself. He does not want a lot of sunshine in his youth, he is not a rapid grower, but he is able to endure what the aspen cannot, and that is shade.

In a few years the green tops of the spruce will begin to show, gradually coming up through the aspen stand, crowding it steadily. The aspens have spent all of their energy producing height growth, and as is the case with the most rapid growers, its reign is of short duration, because its life is short. The slower growing spruce which could support itself under the shade of the aspens, remains on the field, the victor by force of persistency.

COMPOSITION OF WOOD.

Wood is composed chiefly of carbon and water. About one half and

and one-half. Only one per cent. of mineral matter is taken from the soil in the form of food by the trees.

PHYSICAL QUALITIES OF SOILS.

In forest soils, the physical qualities are of first importance, not the chemical qualities.

By physical qualities we mean chiefly the disposition of soils to water, air, the looseness or compactness of soil and its power of heat conduction.

With reference to the disposition of soils to water and air, the size of the soil grain is important. If a soil is too loose it can hold only a small amount of water and quickly gives up its heat. Such a soil is sand. Clay soils are fine grained soils and are usually very fertile. However, should a soil rot into too fine a condition, it becomes exceedingly compact and trees will not grow on it. This is one explanation why we do not find sufficient tree growth on the prairies.

The ability of trees to live on some soils is merely a mechanical ability in which the root hairs are adjusted to meet that one condition of a certain soil.

The shales, slates, limestones, granites and greisses are soils adapted for tree growth. While some of these soils may not be ideal for forest growth, the great alleviator of soil, is humus.

HUMUS.

Humus is decomposed mineral and vegetable matter; it is the duff or leaf mold which you find on the forest floor. Humus is rich in plant food, has great water holding capacity and prevents rapid changes in temperature.

While agriculture exhausts a soil, a forest enriches its soil. Again the tree is not only a product but also a producer.

SWAMP TIMBER.

The reason why trees growing in swamps are, as a general rule, restricted in growth, seems to be due to the fact, that some condition is interfering with the problem of water absorption by the roots. It is concluded that the greater coldness of swamp water has caused a diminished absorbing power of the roots, for the difference in temperature between the water of a swamp and that of other water is quite remarkable.

Also certain salts dissolved in swamp water further tend to check the power of absorption. It is known that the power of osmosis, that is, the process of conducting the water into the roots, is brought about by the ability of a strong solution to absorb a weak one. If the solution of salts in swamp water is stronger than that which is contained in the roots, it is readily understood how the work of the roots is interfered with.

Trees living in swamps have learned to live with a diminished power of absorption, with the result of loss in growth.

ARTIFICIAL VERSUS NATURAL SELECTION.

In substituting artificial selection for natural selection we make sure, that the trees grown are the most useful. We co-operate with nature by studying the laws of natural growth and utilize these laws as far as soil and climate will permit.

The advantages of planting are that the new stand is established at once; planted trees are more certain of success; seedlings may be planted that are best suited to the soil and the trees may be given the right amount of growing space.

NURSERIES.

The seedlings are raised in seed beds. The usual size of a bed is 4x12 feet separated by paths, one or two feet wide, and the beds elevated 12 inches so as to avoid insects and mice.

The soil, preferably a sandy loam, is well prepared, mixed with a fertilizer, such as decayed vegetable matter from the woods. With the help of a roller or plank, the surface of the bed is pressed down until an even surface is obtained.

Light seeds, such as of evergreen trees, are planted in drills, one to five inches apart, depending upon the vitality of the seed. It is important to place the seeds at the right depth. If they are not sufficiently covered they are liable to wash out. If covered too much they fail to come up.

The seedlings remain in the first beds for one year after which they are removed to the transplant beds. The transplanting distance is at least 3 inches by 6 inches for each seedling, but is governed by the rapidity of growth expected.

Transplanting allows the root system of the seedling to become strong and compact and rich in fine hair fibers. The small hair fibers are the feeders of the seedlings. The stronger roots act merely as the skeleton, giving the plant a firm anchorage in the soil.

The buds must have a healthy color, large size and goodly number.

After spending one year in the transplant beds the seedlings are planted out in the open, either in Spring or in Fall. The factors influencing the season are, local climate, labor and time available and the kind of species planted.

PLANTING.

The trees may be placed irregularly or in triangles, squares or rectangles. When planted in a mathematical order, there is a saving of time and expense. The seedlings can be found easily in grass or weeds.

The number of plants used per acre varies between 2,000 to 10,000. The advantage of a large number is, that nature has a better chance to select the fittest, less re-inforcing is required and inexperienced planters can be used.

The advantage of planting stronger seedlings, especially transplants, three to six years old, is, that on poor soils strong plants have a better chance and the maturity of the crop is shortened by a number of years.

We note from the organic struggle in nature, that she is most lavish in the distribution of her time, that the trees which establish themselves do so by the powerful weapons with which they arm themselves in the struggle for existence.

DESIRABLE FORM.

The object of thinning a stand out, is to give the tree that space in the forest which will allow it to produce the best form, the best growth, the best quality and highest yield.

To understand the laws of growth we must know that wood is formed by the manufacturing process which goes on in the leaves under the influence of sunlight.

Every tree in a free and open position will fortify itself by adapting that kind of a system of branches which will give it the greatest amount of food. In such a position the tree will manufacture so much food that the lower portions receive an excess and hence the tree possesses a heavy taper. The crown develops at the expense of the stem.

Trees grown in a dense stand have small confined crowns, make less food and lower portions do not receive much food, the result is a more cylindrical form or even taper.

A tree 15 inches at breast height and 75 feet high, if tapered every four feet, will measure 38.6 cubic feet. A cylinder with a 15 inches base contains 90 cubic feet. Which means to say that 42 per cent out of the possible form of a cylinder have been attained.

The nearer we can approach this ideal form of the cylinder, the greater the number of board feet or cord wood the tree will carry.

If on the other hand the stand is too dense, the food goes into too many specimens, the specimens are underfed and the diameter growth is too slow.

THINNINGS.

To regulate the distribution of food we must know the advantages and disadvantages of an open and closed crown cover.

In the first 30 years of the life of a stand a dense position of the trees is preserved in order to secure form. The close stand makes a long cylindrical trunk, free from branches. After this the first thinnings are made, removing trees that are weak, defective and suppressed. When the principle height growth has been attained, thinnings are made periodically, in approximately 10 years intervals.

At each thinning the crown cover is opened up, the trees respond to the increase of light and space, by making diameter and volume development. When the crown cover meets again and the trees begin to crowd each other, another thinning is made. These periodic thinnings are made from the 30th to the 60th year, approximately. The trees which remain are those which are expected to stand on the area at maturity.

The frequency of thinnings depends upon the quality of soil, the rate of growth and the number of trees which stand on an acre.

The results of thinnings are rapid height growth, the yield is increased, the quality of the trees is improved and the maturity of the stand is hastened.

RATE OF GROWTH.

The fact is proved that the growth of natural forests is very much lower than that of cultivated forests. In our woods right here it requires, on an average, 180 years for a spruce to reach a 12 inch diameter. Under favorable conditions it is possible for a spruce to reach a 12 inch diameter from 80 to 100 years.

However, under our present market conditions it is often not possible to secure the maximum production of a forest and also meet the financial requirements of the investment.

There is a law in tree growth, that the same acre will produce annually the same weight of dry material, no matter what kind of species, provided that that acre pronounces the fullest capacity of sunshine soil and atmosphere.

The active forces which make for assimilation and the energy of the soil remaining the same, the result in the product must be the same. The same cause must have the same effect.

If we ascertain that the maximum production of an acre is annually 200 board feet, we are going to distribute those 200 board feet in such a manner as to centralize it into the best specimens of the trees.

If we have an acre of small trees comprising 5,000 board feet, and our annual growth is 200 board feet, then our rate of growth is 4 per cent. Later on the stand may contain 20,000 board feet, our annual growth is still 200 board feet per acre, but our rate of growth has dropped down to one per cent.

The older a stand is the smaller is its rate of growth. Which shows that the rate of growth is very much better in second than in first growth.

In every stand of trees there is a period when the highest point of production of volume has been reached, and after that period the volume production begins to decline. It is quite important to know when our trees are going back on us.

The highest point of production is reached when the current annual growth is equal to the average annual growth.

STRIP CUTTING.

The strip system of cutting is a type of cutting that is now advocated in the United States as an improvement over the clear cutting system.

In removing 50 to 100 acres in one clearing the reproduction of young growth has been found unsatisfactory. The seeds of the neighboring trees are not sufficiently distributed over the area on account of its size, the soil is too much under the influence of the sun, weeds come in rapidly and the danger from fire is great.

This means loss of growth, and to the owner if he has in mind to operate continuously on the area, it means that the soil lies idle for a long time and the period between removing the timber and securing a new crop is much longer than necessary.

The strip system is a cutting aiming for reproduction. The system aims to remove the standing timber by a series of clear cuttings in narrow strips. It is intended to make two cuttings. The first cutting may remove 40 per cent. to 60 per cent. of the area. The timber remaining is expected to seed the ground and when the young growth is sufficiently established the balance of the stand is removed.

Strips can be laid out regularly only where the ground permits it and where there is little danger from windfall. Under such conditions they are laid out at right angles with the prevailing wind directions to insure proper seed distribution.

No special rules can be laid down as to the width of the strips. Every case must be judged individually on the ground. The wider the strips the cheaper the logging operations. The strips must be narrow enough to allow of proper seed distribution and also soil and germination conditions must be taken into account.

The best results might be obtained by making the strips about three times as wide as the height of the mother tree.

The advantages of narrow strips are that a quick reproduction of the young growth will set in and the soil will not be unduly exposed to the sun.

The distance between the strips is determined by the percentage of the timber that is to be removed. If 50 per cent. of the area is to be cut in the first operation, the width of the bands of standing timber will be correspondingly as narrow.

When the cleared strips have been sufficiently restocked with natural growth, the second cutting is made. The second cutting taking the remaining timber should not be an absolutely clean cutting, because no seed trees would be left. Blocks of trees, sufficiently uniform may be left, but where this is not advisable we must content ourselves with reproduction on half the area, which is better than no reproduction at all.

Regular planning of strips can take place only where the topography is fairly even. In a rough country a regular arrangement of strips is not possible. In such cases the strips are irregular in size and form. The strips are located more on the lower slopes than on the upper wherever possible.

The advantages are that logging is more practical, seed trees above a clearing are better than below a clearing.

In this irregular arrangement, areas which are subject to windfall can be removed and the danger from this source avoided.

The conditions for reproduction, when the second cutting is made, are decided upon in the first cutting. There may be a choice between locating a cutting on a site subject to windfall and on a sheltered site. The exposed site is cleared in the first cutting and the sheltered site in the second cutting.

In fact the first cuttings are organized with the idea of handling most economically the second cutting.

In this country the forests are so irregular and logging conditions so variable, that often in a single operation several systems of cutting must be employed, besides spurious forms evolved.

Cost and profit will always shape any method. Every case must be judged individually on the ground.

PROTECTION FROM INSECTS.

The injury caused to forests by insects extends annually into many millions of dollars.

Every woodsman should have some information on the injurious insects that infest his community. It is not necessary to look into the technical side of the question so much as into the practical side of it.

He should know how to detect the presence of an injurious insect. The change in the color of the leaves, the presence of pitch tubes and fine saw dust borings at the base of the tree are some of the prominent signs.

Then something of the life history of an insect. Insects injurious to forests go through four stages in their life cycle. The egg, the grub, the cocoon and the adult or matured insect.

The second stage, namely the grub stage, is the one that does the most damage. It is the stage in which the insect feeds. The fourth stage, or the adult stage, is the mating period in which production takes place.

We can distinguish between insects that kill trees outright, those which kill trees by making repeated attacks, and those which reduce the value of logs by boring into them, causing defects.

Every insect has a peculiar manner of leaving its mark behind it. Some make horizontal mines, which when they occur in living trees cause death, some make longitudinal mines, which are not so disastrous. Insects boring straight into a tree, hardly ever kill a tree.

Insects which kill trees outright are those which live in the cambium layers of the bark. They are known as the bark beetles. A species of this beetle attacks the spruce here in the northeast.

The cambium bark is rich in food material. The female insect lays its eggs in the bark close to the sap of the tree. The eggs hatch and the grub begins to feed, making horizontal mines and in this way cutting off the flow of the sap.

In controlling the attacks of the bark beetle, it is not necessary to kill all of the insects. That would be impractical. It is necessary to kill only a part of them, scatter their energies, and rely upon natural enemies to destroy the remaining insects.

Insects which kill a tree by feeding upon the leaves, belong chiefly to the moth tribe. The spruce bud worm is a species of this tribe. It attacks chiefly the spruce and balsam. The caterpillar feeds upon the buds of the trees, destroying these and thus preventing the growth of the tree. After destroying the bud it turns its attention upon the leaves, which are eaten off at the base.

The winter is passed in the caterpillar stage, near the bud. In the Spring when the buds begins to swell, the caterpillar feeds on it. The caterpillar then goes through a resting stage and in six to ten days it transforms into a brown moth. The moths are found in the month of July. When the moths are flying they occur in large numbers, are carried considerable distances by the wind, and this accounts for the rapid spread of the insect.

Repeated attacks upon trees will cause the sap to become inactive and the vitality of the tree becomes lowered. Since there is interference with the sap, the peeling of the trees is seriously impeded with, by causing a premature closing of the season for peeling.

Trees weakened by defoliation are readily attacked by the Eastern Spruce beetle. This beetle kills the trees outright.

The work of insects is not as spectacular as fire, but at all times throughout every forest, hordes of injurious insects are at work. The source of this damage is not fully appreciated, but the aggregate loss is enormous.

TIME ELEMENT IN FORESTRY

As the farmer sows and reaps, so the lumberman harvests and must replace. In the majority of cases we are not compelled to sow artificially but

can depend upon natural reproduction. The word reproduction implies the saving of the young growth.

The one thing that makes the production of forests different from all other productive industries, is the time element. We cannot harvest annually what has grown, but must wait many years for the product. Years of patient waiting and observation.

FIRE PROTECTION.

We have given the young growth a prospective value by giving it fire protection. Every annual ring that that little seedling now makes can be considered as annual interest, compounded until the tree matures.

IMPORTANCE OF YOUNG GROWTH.

All of the various systems of cutting timber have in mind the saving of the young growth. To the man who is engaged in cutting down big trees, the life of a seedling means nothing. This is because his mind is not open to the fact that future forests can come only from young growth. He must be educated to the fact.

The natural forest has secured its regeneration for many centuries. Give nature the same natural agencies such as soil, sunshine, rain and atmosphere and the laws under which she operates are invariable, but time is no consideration.

When man enters into a business contract with nature, a new element is introduced, with which nature did not reckon, and that new element is the time element.

The system of man's economy in the production of forests is measured in decades of years, the system of nature's economy in the production of forests is measured by centuries.

Nature's system of economy is perpetual and never changes. Man's system of economy is for the present, but he can make it perpetual and that is by saving the young growth.

The axe creates an unnatural death in the forest, and to meet this unnatural proceeding, we are compelled, by intelligent means, to establish an equal balance with nature.

Fire patrol affords the greatest protection to young growth. Protecting the young growth from without is not sufficient. We need protection from within. We must reach the boss on the job. The felling crew has to be careful not to injure young growth in felling the trees, the skidding crew must avoid breaking down small trees. A careful chopper does not throw his tree into bunches of young growth; an intelligent swamper always avoids small trees to save himself work. A reckless crew can do a great deal of harm, a careful crew can hold down the damage very considerably.

In the prospective seedling lies the welfare of the future forest.

We have harnessed the natural power of the Androscoggin river and made it turn the wheels of machinery, in like manner we can harness the natural power of sunshine and rain, which does not cost us a cent, but which in turn makes for us wood fiber, if only we aid in the shaping of the product. For as long as the sunshines and the rain falls trees will grow.



Chas. Googins
1874-date
Wm. Laffin
1875-date

Wm. Mahaney
1874-date

Ed. Lambert
1874-date
C. F. Lowe
1876-date

PRELIMINARY ESTIMATING, SURVEYING AND MAPPING

BY S. LAURENCE de CARTERET.

During the last few decades the value of timberlands and the cost of labor and supplies have increased so rapidly and competition is becoming so keen that an intelligent purchase or sale of timberland cannot be negotiated or a successful logging operation planned or performed without the possession of an accurate inventory of the property in question.

Applied to timberlands the term "Inventory" means more than a mere list of material. It includes data along the following lines:

LOCATION AND SIZE OF TRACT

Present and future means of access by railroads, Summer and Winter Roads, Navigable Streams.

INFORMATION ON TIMBER:

Amount, location, kinds, size, condition and rate of growth.

INFORMATION RELATIVE TO LOGGING AND DRIVING:

Sites for storehouses, kind and size of timber in each watershed and length of haul.

Condition of ground, chance to yard and land.

Location of drivable streams and size, amount of timber directly tributary to each.

River improvements, such as blasting, side piers, slides, etc., necessary.

Chance for dams and amount of flowage

Distances to be driven to deliver wood.

GENERAL INFORMATION SUCH AS:

Relation of tract to surrounding territory.

Costs to log and drive.

Chance to share cost of improvements and make drives with other owners.

Benefit or detriment of others entering adjacent territory.

Holding space, shorerights, land for sidings, hauling out plants, etc., which should be obtained for future use.

Sources of danger from fire and patrol necessary.

Suitability of land for agriculture if cleared.

This information is obtained by a system of Preliminary Estimating, Surveying and Mapping which gives its results in the form of:

(1) CONTOUR AND FOREST MAPS

Scale 4 inches to 1 mile made for office record and reference, showing:

All cut and blazed lines existing on the ground and all posts thereon.

Important imaginary lines.

Complete drainage system.

Rapids, chutes and portages.

Height of land lines between main watersheds.

General types of timber.

Stand per acre and composition in various localities.

Swamps, scrub, burns and windfalls with dates of occurrence of the two last mentioned.

Area logged each year, and all improvements.

(2) TRACINGS AND PHOTOGRAPHIC REDUCTIONS

Scale of 2 inches to 1 mile, of above, made for use in Logging operations, ect., showing:

Same details as above mentioned large scale maps.

(3) INDEX MAPS

Scale of 1 inch to 1 mile made for office record and reference, and for use in lumbering operations, etc, and showing:

The main drainage and topographical features of a number of the large scale maps and the relation of one to the other.

All large swamps, burns, windfalls and cuttings.

Height of land lines.

Rapids, chutes and portages.

Improvements such as roads, trails, dams, storehouses, telephone lines, lookout stations.

(4) TABULATIONS SHOWING:

Merchantable area in square miles and acres.

Unmerchantable area in square miles and acres.

Total Stand in cubic feet, cords, and M ft. B. M

Total Stand of each species.

Stands by diameter classes.

Average per mile and per acre.

Percentage figures.

Rate of growth.

Area cut over, year by year.

Amounts cut year by year.

Amount cut per acre or per square mile.

(5) DETAILED REPORTS ON THE TRACT AS A WHOLE AND ON EACH OF ITS NATURAL SUBDIVISIONS.

GENERAL CLASSIFICATION OF TIMPER LANDS ACCORDING TO SITUATION.

Timberlands may be divided into two classes according to location:

- (1) Those situated in Surveyed Townships, generally single or groups of lots.
- (2) Those situated in unsurveyed territory, such as large private holdings, Government lands and a few Seigniories.

SOURCES OF DATA, FROM WHICH INFORMATION CAN OFTEN BE OBTAINED PREVIOUS TO DOING NEW WORK.

- (1) For lands in surveyed territory
Township or parish plans, Deeds, private plans, estimates and reports.
- (2) For lands in unsurveyed territory:
Plans of Exploratory or Boundary lines.
Plans of River Traverses.
Plans of Railway surveys.
Deeds or Licenses, private plans, estimates and reports.

Before beginning actual work on any tract, as much of the above mentioned information should be collected as time and conditions permit, and carefully studied, and the following points noted regarding each survey, plan, estimate, license or deed: When made, by whom, for what purpose.

SURVEYS AND ESTIMATES OF LOTS IN SURVEYED TERRITORY.

The lot is located by its number on the corner posts or by chaining to one corner from some known point on one of the Range Lines. If the lot lines are not run, transit or staff compass and chain is used if the boundary has to be established, and such work conducted in the same manner as boundary and baseline work hereinafter referred to under the heading of "Surveys and Estimates in Unsurveyed Territory."

The cruising is done by a two man crew composed of a Cruiser and an assistant. If a single lot is being covered it is advisable to start in from a point on one end of the lot one quarter of the width of the lot from the corner. The assistant goes first running a line with hand compass parallel to the side of the lot, while the cruiser follows, pacing the distance, and sketching in his notebook all streams, roads, clearings, and notes slope and type changes in their columns in book, as far as can be seen either side of the line. Half acre plots, in the form of a circle whose radius is $83\frac{1}{4}$ feet, whose diameters are measured off along the cruise line, are taken three or four times per mile, the number of trees of each species being tallied separately by diameters, breast high, i. e. $4\frac{1}{2}$ feet above the ground. Each plot is computed as soon as tallied by the use of a multiple volume table and converted into cords per acre. This is a constant check on the eye estimate which is conducted all along the line, and these plots are the basis for computing the percentage of different species, average diameters, etc. The other end of the lot being reached the distance is paced to the corner diagonally opposite to the one originally started from, for the purpose of tying in the cruise line. Jogging back $\frac{1}{4}$ the width of the lot, a return line is run and data collected as on the first. The topography page of the notebook shows the boundaries of the lot drawn to scale and all the topographical features seen from the two interior lines. If there are two or more adjacent lots to be covered, the space between the cruise lines may be widened

to the extent of running down the middle of one lot and up the middle of the next, the cruiser shooting off at right angles to the cruise line here and there to make sure he does not miss any unmerchantable areas. The results are made out on reports forms showing numbers of Range and lot, Township, amount of merchantable area, unmerchantable area, total cords pulpwood, average per acre, and amount of other species in ties, poles or M feet. The topographical results are transferred to a map of the region if desired, and the original notebooks should be kept on file for use when the lots are operated at which time they should be taken into the woods periodically and the different jobs plotted to scale on the original plan.

This gives a check on the area cut over and a check on the original estimate, and shows the condition of the lot. These notebooks should always show the lot number and also the Range and Township in which the lot is located. Two experienced men can cover 7 to 8 lots per day if they are in a block, provided general conditions are favorable. One man can cover 5 or 6 per day, but if alone cannot take so many side excursions to look around as it is important to run a straight cruise line, parallel to the lot boundary, in order to pass through average conditions.

By the foregoing it will be seen that in surveyed territory it is a simple matter to cruise lots and to obtain quick results.

SURVEYS AND ESTIMATES IN UNSURVEYED TERRITORY.

RECONNAISSANCE

After collecting and studying the existing data on the tract the person in charge of the work should procure the services of a guide knowing the territory, and make a quick reconnaissance. The waterways are generally the easiest means of access.

Intersections of boundaries of the tract with the water courses should be located and marked so as to be found easily later. If plans of the rivers exist the length of portages and rapids as well as their location should be marked thereon. If such plans do not exist rough ones can be made with the use of hand compass and protractor, the distances travelled on each bearing being measured by counting paddle strokes, estimating by eye, or computing time consumed when traveling on water, and by pacing when traveling on land, ice or snow. All good camping places should be noted and sketches made of surrounding country. This data is compiled with that previously existing and deductions made as to what time of the year would be most advantageous to carry on the surveying and estimating.

If the land is well intersected by canoeable streams the bulk of the necessary supplies should be taken in during the summer and fall and located in caches which can be reached with the least subsequent trouble as the surveying and estimating progresses.

If the streams are swift and shallow and unsuited for canoes, supplies can be taken in cheaper during the winter months with dog teams.

If the country is free from numerous large lakes, swamps and thick underbrush, work can be rapidly advanced during the summer and fall, especially boundaries and baselines, for the party is constantly on the move and

often comes out by a different route from that by which it goes in. Consequently it wishes to travel as lightly as possible and without being encumbered with the stoves, extra bedding and clothing necessitated by the winter weather.

If many large lakes and swamps exist, and there are large areas of windfalls, and old burns containing thick heavy second growth, work is often only possible when the lakes and swamps are frozen over and the snow is deep enough to pass over the fallen trees and underbrush on snowshoes.

In general cruising and traverse work can be done most advantageously in the winter months.

SIZE AND MAKE UP OF CREW.

For summer work an eight man unit, and for winter a nine man unit is the best working combination.

All should be good canoe men so that four canoes can be used to handle outfit and supplies as the party moves from place to place.

On baseline or boundary work the makeup of crew is generally:

- 1 instrument man,
- 1 picket man,
- 3 axemen,
- 2 chain men,
- 1 cook.

The chainmen help the cook move camp when not chaining and the work of the men is often changed to suit local conditions.

For cruising and traverse work the above crew can be divided into three cruising crews, or two cruising crews and a stadia traverse crew, or one cruising crew and a chain traverse crew.

At least two of the eight men should be capable instrument men, three good cruisers, and three others compass men able to run a straight line with a hand compass. All should be good axe men and able to portage canoes and packs.

EQUIPMENT.

The greatest care should be taken to reduce weight of outfit to a minimum. A crew of the above size requires the following:

- 3-7½x9 silk, wall tents, mosquito doors, pipe hole and flap.
- 6 waterproof floor sheets,
- 1 dozen tump lines,
- ¾ dozen pack bags with portage and shoulder straps,
- 3 dozens waterproof food bags,
- ¾ dozen pure wool double blankets preferably Hudson's Bay
- 4 point,
- ½ dozen eiderdown robes with waterproof covers for winter use,
- 1 folding cook stove,
- 1 reflector.
- Cooking outfit and Dishes,
- 2 small heating stoves for winter use,
- 4 16 foot canvass covered canoes,
- 8-10 dogs, 8 sleds and 8 harnesses.

FURNISHINGS REQUIRED INCLUDE:

Paddles, rosin, canvass, axes and extra handles, axe cases, files and sharpening stones, brace and bits, nails, screws, hammer, chisel, small and cross-cut saws, wax and thread, fly oil, first aid kit, containing bandages, antiseptics, needles and silk, and a few simple drugs; snowshoes, snowshoe harnesses and wick, pliers, wire, rope, candles and matches.

INSTRUMENTS

1 transit,
 1 level rod with double targets,
 2 hand levels,
 1 plane table and stadia alidade,
 2 staff compasses,
 2 66 foot chains,
 1 200 foot steel tape,
 1 tape repair outfit,
 1 66 foot metalic tape and refill,
 1/2 dozen diameter tapes,
 1/2 dozen military hand compasses,
 1/2 dozen tallying machines,
 4 aneroid barometers,
 1 barograph,
 2 clinometers,
 1 small drafting board,
 Cross section paper,
 Drawing ink, pens, pencils and erasers
 Protractors and engineer's scales,
 Triangles,
 Crayons,
 Special notebooks,
 Astronomical tables,
 Multiple volume tables.

PROVISIONS.

Here also is opportunity to eliminate unnecessary weight. However, as men on this kind of work are subject to constant exposure, day and night, foods such as pork, bacon and sugar, which are strong in heat producing properties must not be stinted. Canned fruits and vegetables can be eliminated entirely. The following list is chosen taking into consideration food value and elimination of unnecessary weight:

Flour,	Evaporated Potatoes,
Cornmeal,	" Cabbage,
Beans,	" Turnips,
Peas,	" Carrots,
Macaroni,	" Onions,
Brown Sugar,	" Apples,
Maple Sugar	" Peaches,
Oatmeal,	" Prunes,

Bacon,	Tea,
Salt Pork,	Coffee,
Lard,	Baking Powder,
Butter,	Yeast Cakes,
Cheese,	Salt,
Evaporated Milk,	Pepper,

From the above a good variety can be obtained and in a game country can be supplemented by moose, deer and caribou meat, birds and fish.

The average amount of food consumed by one man per day is from 3½ to 4 pounds, dry or raw weight.

GENERAL PLAN OF FIELD WORK.

It is customary in some places to block the country into mile squares by a series of cut and blazed baselines, but in an extensive territory of comparatively low stand, the expense is almost prohibitive as the cost varies from \$15.00 to \$45.00 per linear mile exclusive of mapping and cruising the interior of these blocks. It is therefore advisable to eliminate cut and blazed lines as much as possible, running only exterior boundaries, and interior baselines sufficient to tie up interior mapping and cruising, and traverses of all the important streams. The economic spacing of baselines is dependent on the topography of the country, which in turn governs the distance a crew cruising timber can travel in a day. We find that on the St. Maurice in general, a crew can run 3 to 3½ miles from one line to another, jog over one post and return three miles, cruising and making topographical notes on the entire circuit, so we space our baselines 3 or 3 1-3 miles apart. These baselines are tied across the ends either by exterior boundary lines or river traverses which they intersect, or by other chained lines. By these means the areas of the parts enclosed are established.

Cruise lines are run at intervals of 25 or 30 chains perpendicular to and between each pair of baselines, both ends of each cruise line being tied to the nearest posts on the baselines.

This is the general scheme by which the country is covered.

METHODS.

CUT AND BLAZED LINES.

Existing lines are re-chained and posts set, referenced and numbered, every 25 or 30 chains according to the spacing to be used in running the cruise lines. Bearings are checked either by astronomical observation or by magnetic reading, the magnetic declination being obtained either by observation or from Government records. Slopes are taken with cynlimeter and aneroid readings are made on all important changes of slopes, on all streams and at all posts. New boundaries are run with transit, interior baselines with staff compass and slopes kept and posts set in the same manner. Each cut and blazed line is given a letter name.

The direction of transit lines should be frequently checked by astronomical observation.

In running staff compass lines backsights should be continually taken

to detect local attraction, and where this occurs the field affected is passed through by picketing.

A 66 foot chain is generally used as the unit of measurement but if the country is fairly level or moderately rolling a 200 foot steel tape can be used with accuracy and much time saved. Chain should always be held level and taut, and broken on steep slopes or slope turned into horizontal distance by use of table. However unless slope angles are measured accurately this latter method of chaining does not give good results.

Posts are squared and numbers cut thereon and three or four trees around each post are referenced.

Slopes are read and noted in per cents., aneroid readings are in inches, tenths and hundredths.

Notes on timber are kept on all cut and blazed lines.

RIVER TRAVERSES.

River traverses are made with transit and chain or stadia; plane table and stadia alidade; or staff compass and chain, the instruments being used depending on the nature of the streams and the time of year the work is done.

Since the operation of the land is largely dependent on the drainage system, all elevations are tied in to the watercourses, and it is on the water courses that the main lines of levels are run at the same time that they are traversed. Instruments used are engineer's transit, stadia hand transit, telescopic and hand levels.

CRUISE LINES.

As mentioned previously each cruising crew consists of two men. The assistant runs the line with a hand compass and is followed by the cruiser who notes all topographical changes and also changes of type in the proper columns in the note book for the purpose. As often as the stand changes and at intervals of not more than every 30 chains a half acre sample plot is measured off with a cord $83\frac{1}{4}$ feet in length. This is the radius of a half acre circle. The cruiser tallies all the trees in the plot which are $4\frac{1}{2}$ inches and up breast high, by species and diameters, while the assistant measures a number of trees in each plot to check the cruiser's eye for diameters.

Symbols are used to represent the main species or constituents of the stand such as:

- S for Spruce.
- B for Balsam.
- Jp for Jack Pine.
- Hm for Hemlock.
- Wp for White Pine.
- Ap for Aspen.
- T for Tamarac.
- H for Hardwood, etc.

By grouping these symbols different types and subtypes are represented.

THE FOUR GENERAL TYPES ARE:

Pure Softwood type which covers stands over 90 per cent. of which is softwood

Softwood-Hdwd type which covers stands 50 to 90 per cent. of which is softwood

Hardwood Sftwd type which covers stands 50 to 90 per cent. of which is hardwood.

Hardwood type which covers stands over 90 per cent. of which is hardwood.

These General Types are represented by the symbols C, CH, HC, and H, the letter "C" meaning conifer or softwood.

The Subtypes are the various combinations in which the softwoods are found, alone or in association with hardwoods. These Subtypes are represented by substituting the individual softwood symbols, in the order of predominance of the species, in place of the C in the general type symbol.

To these subtype symbols are fixed Roman numerals representing stand per acre of softwoods in cubic feet of solid wood.

Stands are divided into five classes, the Roman numeral III representing the average; II and I are higher in that order and IV and V lower.

The following arbitrary values are given:

I stand more than 1500 cu. ft. per acre	Average 1600 cu. ft.
II stand 1000 to 1500 cu. ft. per acre	" 1250 "
III stand 500 to 1000 cu. ft. per acre	" 750 "
IV stand 250 to 500 cu. ft. per acre	" 350 "
V stand less than 250 cu. ft. per acre	" 175 "

On this basis notes are taken the entire length of the cruiseline, showing stand per acre, and its components. If in the cruiser's judgment the stand is above the average for that class he places a plus sign after the complete symbol, if less a minus sign. Thus the symbol:

SBH 11—

gives the following information:

The general type is softwood-hardwood

There is more spruce than balsam.

It is a low II stand, between 1000 and 1250 cu. ft. per acre, say 1150.

This would be equivalent to 11.5 eds per acre.

Before a sample plot is taken the stand symbol for that particular spot is estimated by the cruiser. The volume found from the tally shows whether the cruiser's judgment was correct and also the estimate of the predominance of components of the stand. This is one of the uses of the sample plot. But the main object in taking them is to obtain an average figure for each subtype.

This is gotten by constructing average sample plots from all the plots taken in each subtype.

If these volumes per acre are applied to the total merchantable area in proportion to the length of line run through each subtype the result is the total stand on the tract.

Next comes the office work.

MAPPING.

Since series of Baselines are tied together by River Traverses these latter are plotted up first and then transferred to a large sheet of mounted cross-section paper, 20 inches wide by 40 inches long, at the same time as the baselines

are laid out. All posts on these baselines are marked and then the cruise lines are drawn in as they were run in the field, the errors of finishing to right or left of the posts being plotted. On this skeleton the drainage is then plotted and connected up. Profiles of each baseline are made and adjusted to connect with the elevations found on the streams. The horizontal scale of these profiles, which are made from the slope notes and aneroid readings, is the same as that of the map, viz: 4 inches to 1 mile. Profile is laid along line and each 20 feet contour crossing transferred to the line. Profiles of the cruise lines are made from similar data and contour crossings transferred in the same manner. The contours are then sketched in between the various points of equal elevation. The drainage is inked in black and the contours in brown, every fifth or 100 feet contour being a wider line than the others and numbered in feet above sea level. All drivable streams are double lined and as near to scale as possible.

Next are plotted on the baselines and cruise lines the divisions between the four general types of timber, swamps, and unmerchutable areas. These points are joined together so as to separate one type from the other, and these types are colored with crayons as follows:

Pure softwood—dark green.
Softwood-Hdwd—light green.
Hardwood-Sftwd—light yellow.
Pure Hardwood—light brown.

For Swamps the conventional sign is used, and unmerchutable areas are colored in grayish crayon. At each point where a sample plot was taken a small circle is drawn in which is put the symbols representing the components of the stand, the amount of timber per acre in trees 7 inches and up breast high, and the diameter of the average tree 7 inches and up breast high, thus:

SBII
1150
9 inches

By this means a rough idea of the amount of timber in any small area can be roughly computed by averaging the sample plots in the area incuded and multiplying the result by the number of acres in the area.

Intersections of burn, windfall and cut boundaries with the base and cruise lines are marked and connected up and areas affected cross-sectioned with colored inks as follows:

Burns—red.
Windfalls—purple.
Cuttings—green.

The spacing of the cross-sectioning varies with the amount of green timber left standing. In each of these is a circle giving the date of the burn, windfall and cutting and the condition of reproduction at time of survey.

Height of land lines are marked between all important watersheds.

From the foregoing it may be concluded that there is an enormous amount of detail on one of these maps, and with all the attendant plotting and sketching and erasing it is very difficult if not impossible to produce a neat looking sheet. For this reason accuracy and completeness is all that is sought, for

when it is finished it is turned over to an expert draughtsman who transfers it to another sheet. These sheets are made of what is called "Unchangeable drawing board" of two pieces of the best made drawing paper pasted together with the grain of the two sheets running in opposite directions and backed with heavy linen. This makes a stiff sheet guaranteed not to shrink, expand or warp. The transferring is done with an endograph which is an improvement on the pantograph. This machine has a range between enlarging and reducing 8 times an original and on even scale reproduces with the greatest accuracy. The draughtsman doing the transferring should be an expert finisher as these maps are the permanent records.

The same inking and coloring scheme is used on the finished maps as on the originals except that the coloring of the areas of the general types is done in water colors instead of crayons.

Index Maps are made on Unchangeable Drawing Board, on scale of 1 inch to 1 mile. One full sheet on this scale would show the general features of 16 of the large scale sheets. Index Maps show the complete drainage, height of land lines, all boundary and base lines, 100 feet contours, burns, windfalls and cut over areas, roads, trails, etc.

Photographic reductions of the finished maps to the scale of 2 inches to one mile are the most satisfactory as they can be made on single plates, and are a handy size for field use. However, any scale can be obtained in this manner. These photographic prints can be tinted to show the coloring of the finished maps.

Tracings can be made of any of the above maps but is more expensive than photographic reproduction. Still when data is needed before sheets are ready for the photographer, tracings are often made.

COMPUTING AND TABULATING.

Sample plots are first computed to obtain the figures which are put on the maps. From these Average Sample Plots are made for each of the five stands in each subtype. From these Average Sample Plots are found the Percentages of Species and Percentage of amount of volume in the different Diameter Classes.

The Area Classification is made by means of a planimeter, the areas of all swamp, scrub, alders, water, burn, windfall, cutting, being taken off the map and tabulated separately, and allowance made for other unmerchantable area not shown. The balance, or merchantable area is planimeted also and tabulated, as softwood, softwood-hardwood, hardwood-softwood, or hardwood according to the manner in which the areas are colored. From the notebook is taken the length of line in chains passing through each subtype for each of the five stands, and the Total Merchantable Area is proportioned to these subtypes on the chainage basis. To each of these areas is applied the Stand Figure found by the Average Sample Plots and each of these Volumes is proportioned into species by means of the Percentages found for each Average Sample Plot, and these volumes for each species are in turn divided into amounts falling in diameter classes.

Totals are then obtained for each of the General Types and totals of these which are the Totals for the Tract, or part thereof.

All volume figures are computed originally on cubic feet of solid wood, and are turned into cords, rough, peeled or rossed, or M ft B. M. by the use of conversion factors.

Percentages of different natures can be deduced as desired and averages per mile, acres, etc.

Tabulations are made giving totals of Areas and Volumes, and Averages in Cords or M ft. per acre. These are arranged so as to facilitate revision as territory is operated.

REPORTS.

On completion of the mapping and tabulation of each tract a short report is made giving general information relative to drainage, ground, haul, distribution of timber, burns, windfalls, etc., and Accessibility.

All data collected in the field is made as complete as possible, and notes kept in a systematic manner so that the same can be filed for future reference. The data may not be all worked up at the time of mapping and computing described above but is in such form as to be readily used.

REVISION OF MAPS AND ESTIMATES.

The legend used on the maps is such that no erasures are necessary to show subsequent changes such as cuttings, burns and windfalls. That the maps may be of the greatest value surveys of cuttings, burns and windfalls should be made shortly after they occur and put on the maps, and the amount of timber removed or destroyed deducted from the amounts shown in the Tabulations.

CONDUCTING FOREST SURVEYS.

BY N. H. COLLMAN.

TIME.

Climatic conditions are such that the best results are obtained by making three trips a year, averaging about three months each. Two of these trips cover a period beginning in the late Spring and ending in the late Fall. These two trips are made in canoes. The third trip, which is usually the longest, starts as soon as there is sufficient snow for snow shoeing and dog sledding. Because of the fact that our Winter trips deal more with what is most likely to be novel and interesting, it is of them that I shall speak in this paper.

CREW.

Past experience has taught us that a party of eight men makes the most economical and efficient crew for our work. Of these men, two, and sometimes three, are familiar with the use of surveying instruments and are efficient in taking topographical notes and in timber estimating. The rest of the party are usually French-Canadians of a hardy type, accustomed to the work in the bush, such as portaging, running rapids, etc., etc.. It often happens that we have a man in the crew who has trapped or hunted in the region in which we are making our survey. In this case his knowledge of the water ways, portages, etc., is of great aid to us in carrying along the work. One man does the cooking. And right here I wish to state that the cook is a very important man on one of these trips. If an army moves on its stomach, so does a survey crew. The cook must be up in the morning and have a hearty breakfast ready for the crew so that they can start out at day-light. He is never idle. If not busy with his cooking or cutting wood he is repairing some part of the outfit or mending someone else's moccasins or clothes. If one of the crew is sick he often takes his place temporarily. On the days when camp is moved, he and one other man perform the entire work of striking the old camp, loading the dog sleds, moving the entire outfit to the new site, making the new camp and then preparing a big supper so that it may be ready for the crew when they come in at night-fall. From this it is easy to see that the position of cook is not an easy one to fill.

DOGS.

So much for the crew. But scarcely less important than the men are the dogs for without them we could make but slow progress in the Winter work. For a crew such as I have described and their outfit, ten dogs are necessary to do the toting. Our dogs would seem strange to a reader of the works of Admiral R. E. Peary, Jack London or Rex Beach. They are not the wolf like, long haired Eskimo dogs usually described by these writers, but mongrels of all sorts averaging about 75 pounds in weight. Each dog hauls a load of

from 75 to 150 pounds on his sled all day, the load varying as to whether the trail is across rough and hilly country or along the smooth, frozen surface of a river.

SLEDS.

The sleds too, are different from those used farther north in timberless regions. The country in which we work presents every imaginable difficulty for dog sledding. Our sleds must be so built as to be suited to the smooth trails on the rivers as well as to the rough trails through timber, which at best are narrow, full of sharp turns, steep grades and pitch holes. It has been no small problem to obtain a sled that is adapted to all of these conditions, but changes and modifications have resulted in the use at present of a wooden sled, six feet long and about eighteen inches wide, strongly built and well braced. The runners are of iron about three inches wide and about three sixteenth of an inch thick. There is a slight rock from front to back so that the sharp turns can be easily made. The runners have long, gradual, upward curve in front so that the sled may not have a tendency to bury its nose in the snow when going over the many pitch holes that occur along the trails. The cross bars, on which the load rests, are some six inches above the runners. The long teams of many dogs, made familiar to us by the illustrations accompanying stories of life in the far North, are entirely unsuited for our work for the reason that we seldom have a trail, excepting on rivers, where two dogs, to say nothing of six or ten, can get a straight pull. In fact we have about given up the use of two dogs to a sled because of the fact that the leader is using his energy the greater part of the time in pulling the wheeler off the trail on the turns. The dog harness consists of a collar, belly band and traces.

PREPARATION.

Perhaps the best way of giving a condensed and comprehensive idea of our work and the methods and equipment pertaining to it, will be to outline briefly one of our trips. The crew assembles and gathers together food for men and dogs, instruments, tools, cooking and eating utensils, tents, tarpaulins, stoves, harness, and the clothes and duffle of the crew. All told this gives us a total of about five thousand pounds that must be toted in on the dog sleds to the scene of the work, and makes necessary several trips with the dog teams. As only two men are needed to do the toting, they usually start out a week or so in advance of the main crew. They first select the best location for the trail, do the cutting that is absolutely necessary and tramp down the snow as best they can with their snowshoes. They then take in their first load, leaving it at the site for the first camp. The rest of the crew then goes in and starts work while the toting continues until the entire outfit has been moved in. This takes about three weeks for a distance of about fifty miles. It is in this first part of the transportation that the men and dogs together, can, by their strength and experience or by their lack of same, greatly decrease or increase the cost of this part of the work. A strong, willing, well-trained dog, driven by a man who knows well how to handle him, can haul his load quickly and easily over our rough and hurriedly made trails. But the absence of any one of these qualifications in the dogs or men generally results in considerable delay and trouble. Some dogs are continually getting their harness caught on snags

along the trail or running off the beaten trail in an attempt to cut corners, and so upsetting their sled in the soft snow and getting themselves hopelessly entangled in their harness, all of which mishaps require time and patience to overcome them. At its best the work is difficult and requires the best of equipment so that the job may be economically and well done. Sleds, improperly designed or poorly made of inferior materials, are continually getting broken and thus add the greatest of all difficulties to the work of the teamsters. The very best of dog drivers, after having spent a whole day in musing the sleds and dogs over hummocks, around corners, up and down steep hills, in unravelling tangles and reloading upset sleds, etc., is pretty apt to feel that the climax has arrived when to crown all his misfortunes, a sled fails to withstand some sudden strain and comes apart. It is not improbable that this is one of the reasons why survey crews are so justly noted for their proficiency in the art of profanity.

SURVEYING

The party and its outfit being assembled at the first camp the actual work of surveying begins. The first work to be done is the cutting of the base line. In this we use seven men, five of whom do the axe work, cutting out those trees which obstruct the line and blazing it carefully. A sixth man cuts down promising young reproduction for use as pickets, setting them in line as directed by the compass man. The compass man, after taking his foresight, re-directs the picket in the hole occupied by his Jacob-staff and goes ahead to the picket just set. Setting up again in the hole made by this picket, he takes a backsight at the rear picket and from the line thus established, has the next picket set ahead. We have done a good deal of experimenting in order to learn the number of men that will make the best balanced crew for this work and the make up described seems to be the best for our work. If fewer axe men are used the compass man often has to wait for the line to be cut out, while a greater number of the axe men get in each other's way and retard the work. Under ordinary circumstances, such a crew can run two miles of thoroughly cut and well blazed line a day. Greater mileage could doubtless be made, but time gained here, as experience has shown us, is frequently lost by the men's being unable to find the line when cruising. Nothing less than a well blazed line will suffice for the cruisers, who usually walk at top speed at the same time noting all changes in timber and topography and so needing a well marked line in order that they may detect it easily when they reach it. Moreover we very often use our base lines as trail's over which to move camp, and in such cases a little extra time put in on the cutting is well repaid. After the line has been cut and blazed, it must be chained. Two men do this work and it proceeds very rapidly. In chaining, the rear chainman keeps topographical and timber notes and as mentioned heretofore, posts are blazed, four square, every 30 chains. This work is sometimes done while the line is being cut, two men being taken from the Axemen for the purpose. At other times it is done in conjunction with the cruising.

CRUISING

Our method of cruising is as follows: A man trained in timber estimating and in topographical surveying does the cruising with an assistant, who must be able to run a straight course with a hand compass. Starting from one

of the posts on the base line the assistant walks ahead. The cruiser follows. He is equipped with two note books, an Aneroid Barometer and a counting machine or pacer. One of the two note books is the cruise line book, on the left hand page of which are columns headed: TYPE, HARDWOOD, REPRODUCTION, UNDERGROWTH, GENERAL REMARKS and SIDE SLOPE. On the right hand page are columns headed: LINE SLOPE and ANEROID. On this page the Cruiser also keeps a running map of the topography, drawn to scale as closely as possible. Every 350 paces, a half acre sample plot of the timber is taken, record of which is kept in the second note book, called the Plot Book. In addition to the instruments previously mentioned, a Clinometer and a Diameter Tape are used as checks on the ocular judgment of the Cruiser. A Cruiser who works and walks fast can under ordinary circumstances complete his two cruise lines of 3 1-3 miles each and make camp by supper time. Any delay, however, is apt to set him back and with this length of line he is obliged to keep going at top speed all day in order to guard against any delay which may occur through the over-running of a base line or by his running into extensive windfall or burn.

MOVING CAMP.

As soon as we have covered all the territory within working distance from one camp we move along a central base-line as far again as the last strip of country cruised. Here again the great advantage of dogteaming over the slow and more expensive portaging, which we do in summer, becomes evident. For while in summer it takes nearly the entire crew a full day to make one move, with the dog-teams, two men, one of whom is the cook, can accomplish the whole work alone, while the rest of the crew is cruising or cutting base-line or chaining. This means that out of the daily total charge for wages only about 3-8 is consumed for moving, which although in itself necessary, adds no mileage for that day to our total for the trip. In this way with three cruisers we are able to cruise a full seven square miles in a day. It is easily seen that various circumstances will effect the distance and frequency of our moves. We are fortunate that during this coming winter we shall have very nearly an ideal lay of land on which to plan out our work. At the best, moving consumes a great deal of time, which is very costly, so that every possible reduction in the frequency of moves is so much gained, and the planning for this end becomes an important study in itself. The problem sometimes becomes very complicated and deserves perhaps much more attention than is ordinarily given to it. Under ordinary circumstances where the outfit is merely moving straight along a base line of considerable length, we usually work three or four days from one camp. With three men cruising to the base lines on either side, at the end of the fourth day the nearest piece of unexplored territory is about a mile and a half from the camp. It is then necessary to move about three miles in order to make camp at the center of the next unexplored block of country.

SUPPLIES.

You will appreciate that these activities of the surveyors' life are productive of hearty appetites, which must easily seem abnormal to one sitting quietly at a desk and planning out the "Grub-list." With the single exception of the mid-day lunch of the cruisers, every meal must be a hearty one, with

plenty of nutritious, heat producing food. We have the problem always before us of how to furnish a highly nutritious, healthful food, and at the same time keep down the cost, weight and actual physical bulk of the same. Lumbermen have always found that Beans come nearest to meeting our cost demands. Beans are one of our staples. Another is corn beef hash, which is a very palatable food. However, corn beef has its faults, one of which is that each box contains considerable waste and the tins are heavy and unwieldy to handle. This winter we are planning to experiment, if possible, with different kinds of Pemmican; both the commercial variety and that which we can manufacture ourselves with moose and caribou meat as a basis. Bread, of which we use a large quantity, is another problem which we have to contend with. Yeast bread is very difficult to make under camp conditions. This difficulty is partly overcome by carrying a quantity of ready-made bread and keeping it frozen until it is to be used. Hard-tack and Pilot Bread are also used to help out. In this way the cook is able to have a greater amount of flour with which to make doughnuts, cakes and cookies, which helps greatly in keeping the bill of fare from becoming monotonous. The partial use of brown sugar cuts down expense and we find that it is just as satisfactory for many of our purposes. Our French-Canadians are, as a rule pretty high-grade men who know when they are being well treated and also the reverse. A little judicious indulgence here and there undoubtedly increases the willingness and efficiency of a crew. There are also two other arguments in favor of such things. The first is from the standpoint of hygiene. Such foods as those mentioned are really needed to keep the men healthful when they are eating large quantities of heavy, greasy food. Moreover, when they see that considerable trouble is being taken that they should be well fed, they show a desire and willingness to help out the grub list with the products of their hunting in odd moments. Trout, Pike, Partridges, Beaver, Rabbits, Moose and Caribou make very substantial additions to our larder and reduce the amount of grub which we have to tote in. We feed the dogs on corn-meal, boiled in a big pail with meat scraps, grease and occasionally a little dog-buseuit.

I have described, then, the method of our transportation and the equipment used. Experience has taught us that 120 days is about the longest period for which grub can be economically toted in at one time. This period also corresponds very nearly with the usual length of the season during which snowshoeing and dog travel are practicable. In a country not too inaccessible and requiring a maximum in-haul of not more than 70 miles, 200 square miles can be surveyed in a trip of 120 days, provided that the area to be done is not broken up into small blocks and widely separated.

TENTS.

Our tents are of balloon silk, as nearly waterproof as possible. We use two of these, one 8x12 with a two foot wall and the other somewhat larger, for the use of the cook and his outfit. Four men sleep in each tent.

SPREADS

For bedding we use one eiderdown robe for two men. Over the balsam, which is laid directly on the tramped-down snow we spread old canvas covered, felt robes. With the eiderdown over them and the felt robes underneath, two

men, can easily keep warm in the very coldest weather. Too much can not be said of the comfort and efficiency of these eiderdown robes, which are soft and light and still very durable, being covered with light weight duck.

STOVE.

Each tent has a stove, the one in the cook-tent being square with plenty of holes for pots and kettles. The stove for the other tent is round and considerably smaller, being used only for heating purposes. For lighting purposes we use candles. Each sled is equipped with a tarpaulin, which protects the load in transit and may be also used as a ground cloth in the tent when necessary.

TOOLS.

Tools and instruments make up about two hundred pounds of our outfit. We carry a dozen axes of the Canadian type, as they are most suited for the various kinds of work which we have to do. Each man hangs his own axe before starting on the trip and sufficient extra handles are carried to provide for breakage. The stones and files for keeping the axes in condition are the very best quality, as the axes receive very hard usage and it is impossible to carry a grindstone to sharpen them. Our other tools are a rivetting set for mending dog-harness, a tape mending kit, a small combination tool kit, containing screw-driver, chisel, reamer, etc., for use in mending sleds and a cross-cut saw. In addition to the instruments already mentioned we carry a small stadia hand transit, a traverse board and a light Alidade, with a tripod for use in river traverse, etc. Two sixty-six foot chains are carried for miscellaneous work and a two hundred foot tape, which we use in chaining base lines. About two hundred note books are carried in which to record the data and these, together with pencils, erasers, volume tables, protractors, and an engineer's scale, and a small quantity of cross section paper complete our list of instruments.

CLOTHES.

Last, but not least, comes the important item of clothes and personal duffle. Experience has taught us that the nearer we can come to the kind of clothes worn by the natives of the country the better off we are, although, of course, we have the advantage of being able to procure a better grade of manufactured articles than the Indian or Halfbreed Trapper. A pair of heavy mackinaw breeches, mackinaw shirt, heavy woolen underwear and socks, a woolen cap that can be pulled down over the ears and soft light moose-hide moccasins, with so-called duffle tops of Hudson's Bay blanketting, to be bound around the ankles, and heavy woolen mittens with leather pull-overs make up an outfit which answers all our purposes. The instrument man and the cruisers must be prepared for sudden changes of temperature during the day, and also for changes in their own bodily temperature due to the ever changing amount of energy required for their work. The instrument man should have a heavy mackinaw coat which he can carry across his shoulders or slip on as circumstances demand. The best thing for the cruisers is a heavy coat sweater or a mackinaw shirt, the later having the advantage that it does not catch on the branches and tear as easily as the former. The care of the feet is highly im-

portant. Each man should provide himself with plenty of socks so that he may have three or four dry pair ready to slip on at any time. When working under the extremely low temperature conditions which prevail, no chances can be taken with wet feet. If a man gets his feet wet while away from camp he must immediately kindle a fire and remove and dry his wet socks and moccasins. Failing to do this he will invariably freeze his feet, the result of which is a long lay off and in extreme cases the loss of the members through amputation on account of blood poisoning. Single thickness, woolen mittens are the best with leather pull overs to protect them from wear.

MEDICINES.

A small medicine kit must be carried, containing bandages, an antiseptic and a few simple remedies. I am glad to say that we seldom have any use for the kit and its contents, but a single accident requiring its use justifies any trouble spent in carrying it along. The men of course carry their own supply of tobacco.

GUNS.

Each man usually carries some sort of firearm, the Colts 38 cal. revolver being the most used, both on account of its handiness and lack of weight and on account of its adaptability to large and small game. A 30-30 rifle and a shot gun, which are usually taken along, are found to be very useful in making welcome additions to our larder. Besides these things each man carries amongst his duffle, a supply of needles and thread, a few simple toilet articles, whatever reading matter he may care to bring, fish line, etc.

SNOWSHOES

I have reserved the discussion of snowshoes until the last because of its importance. It is an odd thing that good serviceable snowshoes, which are so fundamentally necessary for getting about in the woods in Winter, are so hard to procure, even in the very places where they are as indispensable to a man as his trousers. Every man has his own ideas as to what is the best snowshoe and from the resulting medley of long and short, broad and narrow, round and square, flat and curved, open and close meshed, cow, caribou, moose and beaver hide patterns, it is by no means easy to choose a type that will prove efficient and give satisfaction to the entire crew. We have found by experience that the best all-round snowshoe for our use is the Canadian-Labrador beaver-tail, so-called. This shoe is as broad almost, as it is long, with a very close mesh of caribou hide, woven on a strong frame work of ash or birch. Such a snowshoe is suited to nearly every sort of going and the mesh does not become sogged when wet.

MAKING, DRIVING AND LOADING 4 FT. PULPWOOD

BY W. J. BRADY.

Our operations comprise the manufacture of the rough and peeled wood in four foot lengths in the bush, the hauling to the banks of the streams, the driving thereof to the point of shipment, and the loading onto the cars.

TITLES.

Titles and cutting rights vary in a great many respects. In some instances we own the land or the right to cut all the merchantable timber, or all the spruce and fir, or under reserve of the Vendors right to clear a certain number of acres annually, or to cut whatever wood he may require for his own use, or to have the preference for making our wood, etc. In other instances our rights are for a stated period only or are subject to other restrictions of every conceivable form.

This makes it imperative to keep close tab on all these titles and we have adapted for that purpose a register of titles in which we keep an indexed abstract thereof to which it is much more convenient to refer for general information than to have to read through each time a lengthy legal document.

We are, therefore, sure in giving out contracts for making wood that they do not clash with the nature of our titles and that they safeguard us against the forfeiture of any of our rights.

CONTRACTS.

We have found it much more advantageous to give out contracts for the making of the wood than to employ day labor.

The work is of course spread over a large area and by letting each contract to some one man there is at each place some one personally interested in the Dollars and cents which it represents.

We have also found it preferable to let the contracts direct to parties who will make or supervise the making of the wood themselves rather than to large Contractors who sublet their contracts.

The large Contractor requires a higher price in order to make his own profit and we still have to look after his smaller jobbers because of the advances we are making on the wood and we have not the same control over him as when dealing directly with them.

We have also learned that it is good practice to let a contract to the same jobber to clean off the whole of the lot or lots on which he is to operate, even though the work has to be spread over two or three seasons as prices tend to advance from year to year and because if this is not done it is very difficult to confine him to a given portion of the lot or lots. He will naturally prefer to operate where the timber is best and most accessible and he is apt to leave the lot in such a condition that it will be very difficult and sometimes next to impossible to get a jobber to take off the remainder,

Another important feature is that the contract expressly provide in unmistakable language what we require to be done, and how we require it to be done, and that the contractor thoroughly understands it.

In making contracts for peeled wood from our Own Lands it should be remembered that there will invariably be found trees standing or fallen which will not peel, and which may still be good merchantable timber. Unless a clause is inserted stipulating the delivery of this wood in the rough at a stated price the jobber who has contracted to peel on a certain territory and who meets with such conditions will leave this wood behind and it is of course a loss.

It is also important to properly gauge a contractor's capacity for if he undertakes too much he not only disappoints us but he disappoints himself, and furnishes a bad and discouraging example to his neighbors, and as we have to rely on the same labor field year after year it hurts the letting in his locality.

I am of the opinion that we cannot expect on an average more than one and a half cords per day peeled per man or over one and a half cords sawed and piled per man.

ESTIMATING.

To my mind one of the most important features is to employ competent estimators to look after the contractor when the wood is being made. If this is properly attended to a lot of unnecessary trouble is avoided when scaling, etc. The estimator's work consists in seeing that the contractor is carrying out his agreement in every respect, that he is cutting in the right places, that the stumps are cut low enough to avoid waste, that no good wood is left in the tree tops, that the trees are turned over in peeling and the bark taken off clean, that the wood is sawed to full length and properly trimmed, etc. He also has to keep a close tab on quantities for it is on his estimates that advances are made and it is not only important that the contractor be not over paid, but also that advances be sufficient and that he be made to feel that he is getting a square deal. In our section I venture to say that each jobber making wood on our Own Lands is visited at least fifteen times during the season of peeling and sawing and in a great many instances more often.

Our method of looking after this work is somewhat as follows: A certain section is mapped out for each estimator showing name of Contractor, contract number, lot, range, township, quantity contracted for, and point or place where operations shall begin. On each inspection a report is forwarded to our office daily showing how work is progressing and whether there are sufficient men being employed to complete the contract.

The estimating has been looked after by eight men who work under the supervision and direction of one other, who keeps generally familiar with the whole work. Our advances are made by checks, issued as soon as possible after estimates have been received at the office, approved by the party having charge of the estimators, who also keeps generally posted in regard to contractor's financial standing and whether or not he is paying his labor and bills regularly.

HAULING AND PILING.

The hauling of wood with us generally begins on or about December 15th, where it is placed on the banks of the stream in a place where it will be safe from ice and high water, and in such a manner as to permit the wood being stamped on both ends, say a distance of about three feet between tiers.

It is important with us that wood be piled where it will remain until we require to have it put in the water as there are other drives that precede ours and if our wood falls into the river and becomes mixed it necessitates sorting or counting which has not proven satisfactory.

As regards contractors leaving wood in the woods we have experienced very little trouble on this score, as they are generally receiving the full contract price only on the last wood received, for in most cases they are advanced nothing on hauling until sufficient wood has been delivered and sealed at the river to cover all previous advances made.

SCALING.

A great deal of diplomacy and fairness is required on the part of the scaler for otherwise he unwittingly makes it much more difficult to do business another season. Our instructions to scalers are somewhat as follows: Lists are furnished scalers showing details of each contract, and the quantity of each party on the rivers on which he is to scale. He is directed to make out a scale bill with full details after the wood has been surveyed and every stick stamped on both ends, then to carefully examine all scale bills before sending them to the office, also to send promptly to the office Daily Reports, and all original Scale Bills, to pay expenses of all assistants when working, to scale no wood refused by other concerns as of poor quality and to report if any of ours is scaled by them, to insist that jobbers or owners of wood be present to show him their wood when receiving same.

In our territory we find that the average scaler with the assistance of three helpers to stamp the wood, etc., will handle properly 10,000 cords, but this is more or less governed by the territory covered.

STAMPING.

All supplies furnished scalers such as stamping hammers, rules, snow-shoes, etc., are charged to them and upon return they are credited for same. Our scalers are required to mark the contents and name of jobber on each pile of wood to enable the head scaler to check up scale, stamping, etc., of any particular lot. The best kind of stamp we find to be (—|—) one which produces a mark which is easily applied and which breaks the grain of the wood in such a way that it is not apt to become obliterated by the swelling of the open fibres in the sawed end of the stick.

TIME ELEMENT IN DRIVING.

While the wood is being received on the banks of the rivers the preparations for the drive must not be lost sight of. We have to furnish provisions and supplies and these have to be purchased and stored at places most convenient to the points where they will be required.

Lists are made up for each particular river on which are shown provisions, tools, etc., required and calculated on by the quantity of wood to be

driven and the approximate time it will take to make that drive and such supplies we plan to have placed on or before March 20th, or at least before the breaking up of winter roads.

As soon as the drives ahead of us have passed certain points we place our booms and follow up as closely as possible on each stream. Booming places are located before driving begins and at some narrow point or crook in the river, where if the wood is stopped it will be forced against the bank, or at some point where there is dead water when this can be found, and an ordinary one or two piece log boom fastened to trees or dead men is what we generally use on the smaller streams. One of the first things to do when the drive is actually on is to notify our jobbers and contractors to put their wood in the water. They are notified by the clerks or foremen who are supplied with the names of all parties having wood for us on his streams.

Peeled pulpwood being lighter than rough floats higher in the water and is more easily driven, and peeled and rough mixed drive better on small streams than rough wood alone. On the smaller rivers wood should be driven as soon as the streams open in the spring, and rushed into the larger tributaries but when the larger tributaries are reached medium water, or water which does not overflow the banks and allow the wood to spread over flats and low lands is preferable, as the removal of this wood from these flats is costly to say nothing of the damage it may do to others.

DAMS.

We have had to erect several wooden dams particularly on the smaller rivers, in which we boom and hold our wood back when required, and from which we gather small heads of water, to flush the wood through or over a rough piece of river.

These dams are constructed principally of logs, filled with stone and provided with waste ways and gates varying in width from five to ten feet according to the size of the stream, and the likelihood of log drives of others having to pass through.

LABOR.

As the smaller tributaries are driven into the main rivers we reduce the number of men and crews, and when at last the wood reaches the main Chaudier at a certain point only one crew is required.

TOOLS.

For boats we use on the smaller streams a flat sixteen foot boat, and on the larger streams the thirty foot bateau.

Pickpoles and pickeroons are the principal tools required and although cant-dogs and axes have to be supplied these are principally used in the placing and removing of booms.

Some seasons when there is very little sun we are obliged to dynamite the ice on the heads of the smaller rivers for if this is not done water will have some times run off and wasted away before the ice rises and the channel opens up, and allows passage for the wood.

Clerks are furnished time books, bill and order books, and lists of all provisions and tools shipped and which are checked up by them at the point

where driving begins and they are required to keep memoranda of all transfers to other drives and of all returns made to the storehouse.

HEAD PIERS.

Our piers for stopping the wood at the mill run square across the river where the width is about five hundred feet. These piers, six in number, are placed at a distance of about sixty feet apart, are twenty-two feet wide by sixty feet in length at the base, and twenty-five feet in height. They are built up square to a height of about five feet, or ordinary low water level, and from this point to the top the up-stream face is built on an angle of about thirty degrees, and the sides taper to about twenty feet in width at the top. The reason for reducing the width of piers above low water level is to allow the ice to rise away from the sides and avoid holding back and damming up too much water.

SIDE PIERS.

The piers are three feet above the banks of the river and are calculated to be of sufficient height to take care of any freshet. From head or jam piers where wood is stopped we divide the river with a line of piers and booms for a distance of about three thousand feet to our loading plant and in this space the wood is held after having been sorted. This space has an average width of 165 feet and holds about twelve hundred cords. The line of piers which split the river are built about 600 feet apart, and thirty feet long and twenty-five feet wide, and twenty-five feet high, with front of piers built on an angle of about thirty-five degrees, but we would recommend on a river of this kind that the dividing piers be not more than 400 feet apart and that the up-stream face be built at a lesser angle. Pier timbers are spiked together with $\frac{3}{4}$ inch square irons, at each joint, and cross sectioned forming five foot squares with a flooring of six inch logs in the bottom, and are filled with stone; the fronts of the piers are faced with 3 inch hardwood spiked with 10 inch bridge spikes, and a hardwood log in the center of each pier which acts as an ice breaker; the corners are ironed with six by half inch iron to prevent the ice from cutting the edges.

HEAD BOOMS.

Our principal booms for stopping our wood are twelve inch by twelve inch spruce timber and are 104 feet in length, by 72 inches in width, well bolted together with inch and half square iron, and with twenty-one bolts in each boom, and timber cut to break joints every eight feet. Two of these booms are used in each of the five gaps between the six jam piers. They are hung or placed on the lower side of the pier in a (V shape) which allows the greater pressure of the wood jam to press against the piers themselves. The booms are secured by one inch BB chains coming over the top of the piers and fastened about 16 feet from the upper end of each boom allowing it to rise and fall with the water. A second similar chain coming out of the side of the pier is fastened around the upper end of each boom, and a third chain ($\frac{3}{4}$ inch BB chain) coming from the opposite pier is fastened around the boom about midway, this to prevent the boom from spreading and to aid in raising it in case of a rise of water. All these chains are secured in the center of the piers, and attached to the bottom timbers when the piers are being constructed. Three $\frac{3}{4}$ inch chains,

called bridle chains are fastened around each boom to bind it to the one opposite, one chain being placed at the upper end, and one at the lower end where booms meet, and one midway to hold them from spreading. These chains also help in keeping the wood from going under the booms. The cross chains and those coming over the tops of the piers are of sufficient length to allow of taking up or letting out with the rise and fall of the water.

SIDE ROOMS.

Our booms which divide the river are built of twelve by twelve spruce, four feet in width and from fifty to seventy-five feet in length, and are fastened on the inside of the piers, but we would recommend that they be placed on the opposite side.

The ends of these booms are fastened together with $3\frac{1}{4}$ inch chains, 18 feet in length crossed on the bottom, with the ends of each piece of boom about 12 inches apart so that booms may move inward and outward without binding. These booms are also made fast to one inch chains coming out of the side of the piers which split the river, fastened in the same manner as in the other piers. These chains are of an average length of 50 feet and will allow the taking up or letting down of the boom with the rise and fall of the water.

Between the outside boom and shore the river is again divided lengthwise by a boom three feet in width, which is held in position with one inch wire cable, first secured to the piers below low water level and extended to the shore and made fast to a dead-man, which is provided by burying eight feet under ground a railroad rail, or cedar log with $1\frac{1}{2}$ inch iron rod with an eye on each end attached to it and projecting about a foot above the surface. This boom is merely used for the separation of the wood and is not constructed to stand great pressure.

SORTING GAP.

Our sorting arrangement for separating peeled wood from rough and letting down the river any logs or timber which does not belong to us is as follows: Firstly one of the V booms at the head piers usually the middle one is opened up at a distance of about twenty feet by letting out the chains which sag under water. One of the dividing booms is fastened to each end of the V leaving a gap of about 10 feet. The fastening is made with chains which also sag under water and the wood is sorted through these gaps over the chains.

As many similar gaps as may be required can be provided down the length of these dividing booms.

We do not attempt to separate different marks of pulpwood in the water and know of no practical manner in which it could be done.

On our river it is important that piers and booms be constructed in the best possible manner and be at all times properly secured and we find it advisable to always keep a quantity of chain in reserve for use in cases of emergency.

LOADING CONVEYORS

Our wood is handled out of this pond cut into two foot lengths and loaded without piling. It is taken out of the water on a conveyor about 175 feet in length which carries it up into the mill at an elevation of about 25 degrees.

This conveyor consists of four parallel Jeffrey Number 124 chains with L2 attachments every 16 inches. These chains are about 10 inches apart and travel at a rate of 100 feet per minute. The wood is placed on them cross-wise, twelve men being required to keep them loaded. At the top end of this conveyor, a second conveyor composed of four similar chains but with F2 attachments about 10 inches long and with steel brads riveted on the face thereof, carries the wood along horizontally at the same rate for about 10 feet where it comes in contact with a 7 inch number 19 guage Cross-cut Band Saw, 40 feet 7 inches long running at about 11,700 feet per minute which cuts it in two. This saw is capable of taking care of all the wood which can be placed on the chains and which when running to full capacity will cut it at the rate of better than a cord a minute. After the wood has been sawn in two it drops about six feet into a trough like conveyor know as the Garland Conveyor. It is handled along this conveyor by means of a one inch wire cable with a button like attachment every 30 inches and flights every five feet travelling at a rate of 175 feet per minute.

This conveyor extends out of the mill about 500 feet and is constructed on trestles 20 feet apart and 22 feet high. It is so constructed that a portion of the sides may be removed every 20 feet, leaving an opening five feet wide through which the wood falls into a box-like sluice five feet wide and two feet high and from there into the cars. For a distance of 500 feet on either side of this conveyor railroad tracks are provided and are sufficient to accommodate twenty-four cars, twelve on each side.

PULP WOOD SLUICES.

The sluices are built of two inch hardwood and lined with $\frac{1}{4}$ by 6 inch steel in the bottom.

They are hung to tip toward one track or the other as may be required.

Of course we have to use open top cars. We seldom place more than six cars on the tracks under the conveyor and we move these cars up as the loading proceeds by means of a hoisting engine with a double spool and cable attachment.

When the cars on one side have been loaded the sluices are tipped in the opposite direction and we are thus enabled to take out the loaded cars, and run in more empties without stopping the conveyor. The loaded cars are hauled to the main line of the railroad about a quarter of a mile distant where we have a four track siding which will hold about 160 cars. We use our own shifting engine which will handle twelve empty cars or six loaded.

This plant can also be used for loading four foot pulpwood, by removing the band saw and placing every forty feet under the upper sluices which then serve principally to break the fall of the wood, second sluices, on which it rolls down to the car on tables about 30 inches high from which it is taken by men and piled. In this manner about thirty men are required to do the loading, while in the former only four are required.

CUTTING PULP WOOD.

In our opinion a band saw is far superior to a circular saw for cutting pulpwood as it requires much less power to run it, there is less danger of its

pinching in springy wood, it stands the constant feed better, and it makes less sawdust and consequently wastes less wood.

IMPROVED LOADING PLANT

For an inexpensive loading plant we would recommend the use of a chain conveyor similar to ours, but with only two chains sufficiently wide and strong to handle the load, and located in such a manner as to have the current of the stream carry the wood onto the chains. We would place the cutting up arrangement as near the river as possible thereby dispensing with the use of a needless lot of chain and after the cutting, elevate the wood only to a sufficient height to allow it to drop over the end of the conveyor into cars running crosswise of the chains on a track so graded as to allow the cars to be moved down by gravity.

By providing two forked sluices at the end of the conveyor to be used alternately continuous loading could be secured and as much work could be accomplished as we are now doing at St. Mary at considerably less cost.

Of course such a plant would have to be located with due regard to such requirements, and locations offering them and otherwise suitable for a loading plant might be difficult to find.

The usual practice for loading wood in our part of the country is to use a single chain and a troughlike spout in which the wood is placed lengthwise and we are safe in saying that as compared to a conveyor on which the wood is placed crosswise it will not handle over one third the quantity.

In concluding we present the above as a practical plan of reasonable economy which we are year by year striving to improve, and are ready to welcome any suggestions by which it may be bettered; realizing, that no one profits by waste, either in time or in material or in labor, but that on the contrary we all derive a more or less direct benefit from everything, however, trivial it may appear, which tends to increase the efficiency of human endeavor in any legitimate field.

THE MAKING, DRIVING AND SCALE OF 13 FOOT LOGS.

BY W. J. BIGNELL.

JOBBER.

There are a great variety of jobbers, from the man who owns one horse and contracts for two hundred thousand feet, to the big jobber who is ready to take a contract of from five to fifteen millions and relets again a large part to sub-jobbers, furnishing them with provisions. Small jobbers are sometimes in debt all their life to a big jobber, getting their living and no more. To a certain extent the large jobber and the small jobber each have a distinct function, but in general the small jobber is to be preferred as he is more able to give personal attention to every detail. A small job usually consists of from five hundred thousand to a million and necessitates from two to six horses and a dozen men.

There are also two general classes of jobbers, whether large or small; one the man who makes jobbing his main business, and does whatever other work he may find in the summer; and the other the farmer who takes up jobbing during the winter only when things are dull on the farm. Price being equal, the first is the most desirable. He is ready to start for the woods in late August or early September, while the second does not usually show up until November. An early start assures of a definite quantity being made, especially if the season is a bad one, as the snow and late Fall interfere largely with the work.

Jobbers as a rule are intelligent, shrewd traders and hard workers, and have the short log business down to a point that closely approximates Scientific Management, although none of them have ever heard of this art.

The one horse jobber usually has three men beside himself, and the business of cooking is intrusted to the most capable or the most willing, or often done by the jobber himself in odd moments. The horse is often stabled right in the camp without a partition, for the purpose of heat. Wives and families are found in the woods, in which case the wife usually is cook. Larger jobbers run their camps in much the same manner as is done elsewhere.

The jobber's horse is a tough, wiry animal of about twelve hundred pounds. There is a fairly common saying to the effect that it takes twenty years to make a man and only four years to make a horse, so "marche l'animal."

CHARACTER OF LAND AND KIND OF TIMBER.

The woods cut are spruce, jack pine and balsam. Logs are all cut to a length of 13 feet 6 inches and limbed off to a diameter of 4 inches at the small end. The character of the land is hilly and broken and full of gullies. Black

spruce swamps abound, rather curiously on mountains as often as in bottoms. There is an abundance of logs and the territory is well watered with drivable streams.

METHOD OF MAKING.

Jobs are let from July to September. The jobbers are supplied from storehouse and prices are made as reasonable as the freight will allow, as an inducement. Most accessible territory is snapped up first, the more distant waiting for the construction of good tote roads and telephone system. Such improvements greatly assist in the letting of jobs and are of increasing value over a period of years. The general boundries and amounts in each job to be let have been predetermined by the forest survey, which is an important and useful accessory to letting operations successfully and facilitates and systematizes the work.

A jobber's operation is divided into teams consisting of one horse and four men, which cut and haul to the streams about three thousand feet per day. It is very amusing to one who is accustomed to large logs to see a teamster when yarding pick the small logs up in his arms and walk across the yard with them instead of rolling.

The principal instrument employed in handling the logs on and off the sleds is a hay-hook, usually used in the handling of cord wood, although a cant dog is kept handy for the larger logs. Little or no roads are made, and one horse can haul from 125 to 175 logs per day with little swamping done for him. Rollways contain from one to five hundred logs and are placed along the river banks within a few hundred feet from each other wherever most convenient. This necessitates many branch roads, and here again the swamping and road making is kept at a minimum, for in hauling with one horse the equipment is light enough to get around or over almost every impediment. Heavy loading is begun on branch roads whenever there has been sufficient travel to warrant it. An average load for a horse for the winter would be from four hundred to five hundred feet daily. This one horse system of logging has been demonstrated by actual experience and actual cost statistics to be the cheapest method under local conditions within a radius of four trips per day. At a distance greater than can be made in four trips per day it would be necessary for the company to assist its jobber in evolving other methods which will more nearly approximate those used elsewhere.

SCALING.

The scaling used in this region and in all parts of the Province of Quebec is the Quebec scale, and is made by the scaler who has an assistant. The scaler must hold a certificate obtained at a public examination from the Quebec Government, certifying that he is qualified to measure logs. He stands at one end of the rollway and his assistant at the other. Starting with a given log the assistant measures his end, calls the diameter, whether top or butt, kind of wood, and any defects noticeable. If the assistant calls top when giving the diameter the scaler merely glances at his end of the log and records the tally. If butt has been called by the assistant the scaler must determine the size of the top or small end facing him by measurement, as the diameter of the

small end only determines the contents of the log. The assistant in turn makes the measurement for tops facing his way and marks them with a crayon. In rollways the scaling is necessarily slow, as the scaler and his assistant often cannot see each other and have to take time to determine that they are keeping tally on the same log. When the logs are landed on the ice the work goes faster. An average winter's scaling for two men is five million feet, and a fair average for a day's scale consists in measuring 2500 logs. Logs dragged in from the stump to the streams are scaled early in November in order to be ready for those logs which will be hauled in on snow.

The scaler's duties also consist of making a careful inspection of stamping and bark marking, in which they co-operate with the regular inspectors. They also have to watch closely for short logs.

The jobber is obliged to keep a shanty book furnished by the Government. In this book he enters the number of logs which he cuts each day. The scaler is also obliged to record his scale in the shanty book, so that their accounts are supposed to balance as to the number of logs cut during the season. The final returns are sworn to by both jobber and scaler, and the stumpage dues are collected by these returns.

Inspection for the supervision of cutting starts as soon as the jobber comes to the woods, an inspector being able to take care of about ten million feet of lumber. Duties of inspectors are to make the rounds once a week and report stumps, tops, cutting, bark marking and all other points which go towards making an efficiently conducted operation. Where the work is not up to the standard after a warning, fines are imposed as stipulated in the contract. The inspector must also keep track of the jobbers boundaries, blazing them and seeing that the jobber does not cut outside except by permission, and also that he cleans his area properly. The government has a system of inspection as well. Their inspectors visit the operations once a month during the logging season, and also check the scale made once or twice during the winter.

THE DRIVE.

Ice does not usually go out and driving commence until about the middle of April or later. At first heavy frosts at night followed by warm days and hot sun raise and lower the water, but by the first of May a continuous freshet is assured. Where dams are to be had on small streams enough water is collected to flush the brook and driving is made more regular, although often ice formed on the falls during the night must be dynamited. Crews are usually required about April 25th when the break-up comes with a rush. Men who arrive before actual driving commences are paid winter wages to hold them, so that it is advisable to make a close calculation to avoid expense. The season of high water is about one month's duration. There is usually a second flood due to warm rain or the ice going out of the numerous lakes, which comes to help out during the latter part of May.

Short logs make a surprising amount of rear. Their favorite place for stopping is an eddy, and they often make wings containing twenty-five to fifty thousand logs. On shallow, sandy streams they make centers readily, starting on any obstruction which may catch a few and backing up in a narrow formation which increases in length until they often reach a quarter of a mile.

Sometimes they start to twist towards the shore and finally reach one bank of the river barring half of the channel. If the water is not dropping too rapidly, after reaching a certain length part of the center will break away by itself, but other logs will soon take their place. Very little tending is required after the first jam of logs pulls by, as it is difficult to block the river with a jam of short logs.

In large rivers a floating jam of logs in an eddy often forms to the amount of two hundred thousand pieces, floating around and slowly revolving, but unable to leave the eddy. One such floating jam of several hundred feet across stood some 20 feet out of the water and required fifty men for five days to demolish it. The method of formation was that the short logs as they struck the eddy slowly disappeared under the jam raising it higher and higher out of the water and twisting together in an almost inextricable mass.

The main problem with short logs is the small stream on which much calculation, organization and direction is necessary to drive them with the least expense.

The river drivers are principally French. Individually they are good men, but do not work enough in unison, and when doing so are inclined to argument and wrangling concerning the best method of doing things, thus losing time and wasting energy. The boatmen among them, however, are the best boatmen in the world, and cannot be surpassed in white water. The majority of them are not smart on logs. Thirteen foot logs averaging forty-five to a thousand are extremely difficult to move around on, and good men on logs are very good, and the rest do not attempt to go on logs at all unless forced to.

The principal tool used is the standard cant dog. Pick poles and gaffs are also used. We also have a tool known as a hand dog. This is only used on falls or extra dangerous places which have jammed. It is made like the dog on a cant dog, has one ring at the opposite end from the point and another ring near the point and long ropes are attached to these rings. A gang of men on one shore hold the rope fastened to the ring in the end of the hand dog, and a couple of men on the other shore manipulate a smaller rope fastened to the ring near the point. Between these two ropes the hand dog is dropped into the desired position on any log and gets a grip. A large gang on the main rope can exert considerable force and tear out log after log which could not be otherwise reached, and bad jams on falls or in gorges are often broken in this way. The men on the secondary or smaller rope must watch an opportune moment when the log is extricated and heave away to pull the dog free from the log. Dynamite is very servicable, almost invaluable in fact, in loosening short logs in wings and in frozen rollways and in jams.

It is the custom to often get a certain amount of work, such as the taking of a certain rear, or the removing of a certain jam or wing, or the rolling of a landing, done by contract. The contractor agrees to do a certain amount of work for a definite amount of pay, no matter how short or how long the job actually proves to be. This interests the men greatly, and much calculation and argument is indulged in with the foreman before a bargain is sealed. The contractor speeds up to the last inch when the job has been taken, but this way of driving is of doubtful value.

MAKING AND DRIVING LONG LOGS.

BY P. W. CHURCHILL.

The making and driving of long logs is far too broad a topic to be covered in a few pages. It is the writer's intention to confine himself to a discussion of local conditions, considering the subject from the standpoint of the Manager in making up his general logging and driving budgets; and a discussion of the operations themselves, both logging and driving, with particular attention to some of the important factors.

THE BUDGET.

At the close of each year's operation the Manager begins to formulate his Budget for the coming year, showing when and how the required amount of logs is to be procured, and their estimated cost delivered at the mill. He must first be advised as to the requirements of the Manufacturing Department for the ensuing year. There are three sources of supply: own stumpage, which may be cut by Contractors or by the Company's own camps; purchased stumpage, which may also be cut by the Purchaser or by Contractors; and purchased logs. The Manager supplies his requirements from these sources, but not indiscriminately, because he is influenced by the necessity of insuring a prompt and continuous supply of logs for the mill as soon as the river opens. Neither can logs be landed at random on streams and lakes on account of limited stream capacities and the necessity of arranging economical driving loads for streams and lakes. For example, it would be absurd to land twenty million feet of timber on any small stream to be driven on freshet water, or to take a drive of only five million feet through the lakes. The Manager's problem then is to secure his supply of logs from three sources, so distributed as to insure a prompt and continuous mill supply, and an economical drive.

We will pass over the work of laying out jobs and letting contracts, and assume that a well balanced operating plan has been arranged, complying with the requirements just mentioned. This brings us to the determination of the final cost which is a purely mathematical operation, consisting of adding estimated costs of driving, tolls, improvements, scaling, general expense and logging, to the known stumpage costs and cost of purchased logs. The estimates are made after a comparison with previous performances. This constitutes the financial part of the Budget for both logging and driving.

The detailed driving Budget is made up in February, after the logging operations have progressed far enough to indicate the approximate amount of timber to be handled by each drive. A foreman is appointed for each drive, and blanks are sent him on which to report the number of men and amount of repair supplies, rope, dynamite, tools, etc., needed. Supplies and tools for early stream drives are toted on snow in February and March to the driving camps, and the Storehouses are stocked up for lake and main river drives. The driving Budget is not a financial estimate, but an estimate of men and supplies required; the former being shown by the General Budget.

In order that the Budget, which is an estimate, may be compared with what actually happens, the accounting system should produce at the end of the season a cost sheet made up along the same lines as the Budget itself. This would enable the Manager to check his work and would make possible better estimates in the future.

CONTRACTORS.

Most of the logging on the Androscoggin is done by Contractors, and a word in regard to the management of such operations seems proper. The Contractor's agreement obliges him to clear a certain described territory, or to cut a designated amount of timber, the contract specifying the species to be cut, stump diameter limits, top limits, per cent. of undersize timber allowable, lengths into which logs are to be cut, marking and stamping, method of landing, distances between roads, and method of cutting with a view to preserving the small growth and preventing waste of merchantable lumber. It is the duty of the Scaler and Inspector to see that the Contractor observes the terms of his contract. Each of them is provided with a copy of the contract and each has certain contract requirements to look after. The Scaler keeps a record of the undersize timber and is responsible for the manner in which the timber is cut up, marked and stamped, and the condition of the landings. The Inspector, who goes over the job every week or two, checks up the scaler's work and also goes through the cutting and reports any variation in the operation from the terms of the contract. It is also the Inspector's duty, if it appears that the Contractor is behind in his work, to influence him to increase his force. There is one other very important matter, although not connected with the physical side of the operation, namely, the payment, of the Contractor's labor. In New Hampshire a laborer cannot claim a lien on the logs for wages unless he serves notice on the Owner at the time he begins work that he will do so. This, to the writer's knowledge has never been done. In Maine, however, there is a statutory lien on logs for labor, which makes the Owner responsible for the pay of his Contractor's men and no notice is required. It is necessary, therefore, to insert in the contract for a Maine operation, a clause obliging the Contractor to render a monthly statement of wages due his men, the amount to be held in trust by the Owner, payable to the men upon discharge. This statement is checked by the Scaler and the time bills issued to the men are drawn by him and signed by the Contractor. Reports to the office weekly and monthly, covering the points enumerated, keep the management informed as to the progress made, the conduct of the operation, and the financial standing of the Contractor.

LOGGING.

This brings us to a consideration of camps operated by the Company itself, and first to the preliminary work which should be done on every job. This work consists in locating the timber to be cut, with reference to township and section lines, streams and lakes, location of tote road, two-sled road, camp site, yards, and landings.

The tote road generally takes the nearest route to the source of supplies, avoiding hills that are too steep, and streams requiring too many bridges. The amount of timber to be accommodated determines the amount of money

that may be expended on a tote road, as a road to be used for several seasons may economically be much better built than a road for one year's use only. One large concern in Maine figures two hundred tons of supplies for cutting and hauling one million feet of logs, and bases its tote road expenditures accordingly.

Two-sled roads follow the water courses, which show the natural outlet for logs, and are laid out with a view to securing a gradual descent, avoiding, if possible, grades of more than 5 per cent. and level stretches, and cuts. On grades of over 5 per cent. a load acquires a great momentum, and has to be checked by hay or gravel. Level stretches must be iced, and cuts are expensive.

The three requisites governing the location of the camp site are good water, good drainage, and nearness to the timber.

If the timber is to be landed on a lake about the only necessity is to secure a proper outlet for the two-sled road onto the ice. Stream landings are located on high banks to avoid long rolls. If the landing is farther from the camp than men can be walked, or if the two-sled road is a turn and a half or a two-turn and a half road, a landing camp is built for landing crew and two-sled teams. The Yards are spotted out on the two-sled road, which may have one or more branches, to convene to the best advantage the timber to be cut. This preliminary work should be done by the Camp Foreman in August.

Having laid out his job the Foreman has then to figure on the number of men and horses needed and the proper time to begin work. Timber on ground suitable for Fall yarding should be hauled in the Fall, so that it will not be necessary to put in a large yarding crew for a shorter time, and to enable the crew to finish yarding before the snow is deep. Soft ground cannot be hauled across until frozen, and rough ground requires more snow than level ground that is smooth. The two-sledding season is limited to about ten weeks which necessitates the hauling daily of about 1.7 per cent. of the total amount. After estimating the amount that can be yarded and two-sledded per day per team, the foreman is able to determine the force necessary for the work.

The operation begins in the Fall, early enough to build the tote-road and camps in time to do the Fall yarding, and cut the two-sled road before snow fall. The crew lives usually in tents until the tote-road is built and then moves up to build the camps. Camps in this section are one story log affairs, round logs being more economical, as a rule, than boards, although boards of the cheaper grades are, when possible, used for roof and floors if considered cheaper than poles and hewed logs. A set of camps, comprises a mens' camp and cook room, connected by a dingle used for storing supplies, a hovel, blacksmith shop, and office. In New York State when boards are used, a two story camp is sometimes seen, the cook room being down-stairs and bunk room above. On large railroad operations portable board camps are constructed in sections and moved from one location to another. In Maine and New Hampshire, a set of camps for 75 men and 30 horses costs about \$1500.

As soon as the camps are completed a crew of swamper and choppers is set to work cutting out the two-sled road to a 20 foot width. Bridges are and should be built across the streams where necessary, if possible, on a slight down grade. Heavy grades are lowered by cuts, and the outside of grade

curves are built up by laying skids onto side logs laid parallel to the road. On side hills the earth is grubbed out and side logs and skids also laid. The road has a rough appearance before snowfall, and is worked into shape by hauling light loads at first and gradually increasing them. Two-sled roads cost to build from \$500 to \$1,000 per mile. The maintenance cost depends upon the grades, level stretches, and amount of snow.

Fall yarding begins as soon as the camps are completed. The equipment of a yarding crew consists of a sled with 3 inch runners shod with 3/8 inch steel. The bunk is fastened to the runners, with starts and raves. Two horses are generally used, although on very short hauls roads for one horse require less swamping and save the small growth, and have sometimes been used. A yarding crew consists of two choppers, a sled tender, swamper, teamster and landing man. The total average cost per day is \$2.10 per man and \$1.50 per horse including horse equipment; the total cost of yarding crew being therefore, \$15.60 per day. In some instances where the work can be done with less labor the crew is cut down to 5 men. A Yarding team scale is usually made for the purpose of comparing the work of different crews, and to stimulate competition. Within the last few years the practice of letting the cutting, fitting, swamping and loading of logs to three men cutting crews on a piece basis has sprung up and proven successful. The teamster and yardman, however, are paid by the month. The price paid for cutting is \$1.75 or \$2.00 per thousand feet, the men paying for the board at \$3.50 or \$4.00 per week, and for their tools. On one occasion it was found that yarding crews increased their output 33 1/3 per cent when put upon a piece work basis. Attempts to get comparative figures on the two methods of cutting by figuring the costs on crews that have been cutting by the M and changed to day wages and vice versa, are usually of little value as the conditions change at the same time. Following, however, are costs of cutting by the two methods, exclusive of general overhead charges, figuring the team at \$3.00 per day, choppers and sled tender at \$38 per month, yard man and teamster at \$35 per month, and \$1.75 and \$2.00 per M for cutting, deducting 50c per day for board:

Amt.	Per	Cost per M	Choppers'	Cost per M	Choppers'	Cost per M	Choppers'
Day	wage basis	Wages	@ \$1.75	Wages	@ \$2.00	Wages	
3600	3.36	1.46	3.45	1.25	3.40	1.50	
3500	2.85	1.46	3.20	1.54	3.20	1.79	
4000	2.52	1.46	3.08	1.83	3.08	2.08	
4500	2.24	1.46	2.93	2.12	2.93	2.37	

From these figures it appears that cutting by the M is the more expensive method, and it certainly is unless it results in an increase in production. It all depends upon whether a crew is delivering a day's work in return for a day's pay, and it can not be disputed that in the woods few men work with that intention. It is customary for crews cutting by the M to contract to cut a certain area, and 25c per M is held back to keep them to their agreement. Even so, however, they are not slow to quit when their production drops from 4 to 3 M per day, and the figures above given show that even in that case they come out ahead. Each job is a problem by itself, and only by watching closely

the work of the crew can it be determined whether piece work would be more economical. In cutting by the M there are certain advantages which cannot be represented in dollars and cents which should give that method the preference at the same cost. A scrub yarding team can be put on to catch up with them, if they have logs ahead of their team, which procedure in the case of a crew working by the month would result in a walk-out. There is less lost time, the men are more careful of their tools, and require less supervision.

The yarding is conducted with the intention of preserving the small growth. Roads are run as far apart as possible, and bunches of small trees are not entered for less than five sawlogs. The trees are cut to a specified diameter limit, varying with the local conditions.

The matter of brush disposal has been agitated recently as a means of preventing fires. Burning brush in the woods in the winter would probably cost less than 50c per M on the timber cut. If done in the spring the soil would be consumed to a great extent. In any case, serious damage to young growth could not be avoided. Lopping the tops of trees has been tried as a partial remedy. It was supposed that this would cause the brush to fall flat upon the ground and decay more quickly. Looping costs about 10c per M and has not proven a success. If all lumbermen were compelled to burn their brush a great saving in fire losses would undoubtedly result, and everyone would be on an equal footing as to costs. But until that time it is quite unlikely that brush burning will be popular. It has also been suggested that clearing a circle around cuttings would be useful in preventing the spread of fires, but no figures are available as to the costs or results of this method, and its value is still an open question.

Two-sledding begins as soon as there is snow enough for hauling purposes. The sleds are constructed very heavily and reinforced with iron. The runners are 5 inches wide and shod with $4 \times \frac{1}{2}$ inch steel, forward runners are $10\frac{1}{2}$ feet long and rear runners 11 feet long on the run. The bars are fastened to the runners with raves and starts. In some localities block raves are used and in the West castings fitting over the runners and through which the bar runs are popular. The main advantage claimed for the block rave is the fact that fewer bolts are necessary in the runner and the runner is accordingly stronger. Sled knees are used on roads which are smoother and more level than is usually the case here. A long runner with a heavy load pitching into a hole in the road sustains a severe strain, and a rigid casting such as a sled knee would exert a leverage strong enough to break the runner, but in case a runner is broken it is easily removed and a new one put in place. Runners invariably break underneath the bar, although reinforced by the side plates. The type used in this section is weakened by the presence of two $1\frac{1}{4}$ inch starts, four $\frac{1}{2}$ inch S. S. bolts and four 3-8 inch side plate bolts immediately under the bar. Water works under the plates and into the bolt holes, and that part of the runner decays very rapidly. This may be remedied in part by using for runners only seasoned wood which has been given a thorough treatment with some wood preservative. Two sleds are connected either by tog chains or thills. Tog chains bother when loading and the load must be better balanced, but the sleds rack more easily. Thills are easier to handle and are in more general use, but cannot be used when logs are hauled full length. A

standardization of 2 sleds is greatly to be desired, that parts may be interchangeable.

The average two sled load in Maine and New Hampshire is about 4,000 feet, depending upon the character of the road. When the sleds are loaded the teams take them to the landing at a trot, averaging 6 to 8 miles per hour. More time is required for the return which is rarely at a faster rate than 2 miles per hour. Eight two sled teams landing upon a lake and hauling on a two turn road requires 16 loaders, 8 roadmen and 4 to 6 landing men. The road has to be plowed after storms, and level stretches rutted and iced. Grades exceeding 5 per cent. have to be hayed or gravelled. The cost of maintenance varies with the character of the road and with the weather.

Logs landed on the ice on lakes are surrounded with a chain boom made of large logs not less than 11 inches in diameter at the top end. The logs are bored not less than a foot from each end with a 3 inch auger, and are fastened together with $3\frac{1}{4}$ inch boom chains, and plugged. Landings on streams are rolled evenly without cross skids, in such a manner as to be easily broken in the spring. Teps are not permitted to be dumped between the tiers. The roll-ways are not continued across the stream, but leave an open channel on the farther side.

Toting is the largest overhead expense in the cost of a logging operation. The cost of toting supplies varies with the road, distance to haul, and the seasons. A good road permits the hauling of a heavier load. On a short haul more time is lost, comparatively, in loading and unloading. Fall toting is, on woods roads, four times as expensive as winter toting. December is an intermediary month for toting as through the first half of the month Fall conditions usually exist.

DRIVING.

Driving is not as exact a science as logging. It is an emergency job, and every stream is a different problem every year. The amount of timber that may be driven out of a stream is determined by the amount of freshet water, the character of the stream, and the size and length of the logs. The driving capacity of streams is increased by building dams which conserve the freshet water, and by removing obstructions, such as boulders and stumps, from the channel. Abutments are built where the banks are low and the channel wide, to keep the water within a narrow channel; also along soft banks, and by projecting ledges against which the logs may catch and plug. Streams become more difficult to drive each succeeding year because the banks wear away and the channel becomes wider.

Driving repairs, including stream improvements and repairs on streams are made in the summer or fall before. Early in the spring driving supplies are put into camps, and telephones placed at dams and at bad points along the stream.

As soon as the spring break up comes men are rushed to the streams, it being necessary to let no water go to waste. Often the weather turns cold after the first warm spell and the men are kept waiting from one to three weeks. When the driving begins, landings are broken and the logs driven on heads of water from the dams. The greater the amount of water that can

be controlled the more efficiently and economically may the logs be driven. Men are distributed along the streams to keep the logs moving. The logs frequently plug and if the key log cannot be broken by a charge of dynamite the logs are stopped at the nearest dam above and the crew has to stop sluicing until the jam is broken. Dynamite breaks up a great deal of lumber, but it saves time and time means money on the drive.

There must be men enough breaking landings to give the stream its maximum load on each head of water, and men enough below to keep the logs moving. The foreman in charge aims to use the water and to distribute his men to the best advantage.

Where the streams empty into lakes the logs are caught in chain booms which hold from two to three million feet. The capacity of the boom varies with the size and length of the logs. An article under the title of "Boom Areas" written by Mr. A. M. Carter and published in the American Forestry Quarterly gives the surface area for logs of different sizes.

Booms around logs landed on lakes should be carefully inspected by a reliable man, to pick out weak chains and to see that the boom has been built in accordance with the requirements above noted.

Lake drives begin as soon as the lake is open, and the booms are towed to the outlet of the lake by steamers, especially designed for such work. The crew consists of a Foreman and Assistant, Engineer, 2 Firemen, Cook, and a Boat's Crew. Paddle wheel steamers are preferred to propellor driven boats because in case of a break to a propellor or its shaft the latter type is more difficult to repair. For turning logs out of a boom into a river, or booming logs out from the mouth of a river the usual average crew required is 16 men. In sluicing through a dam the crew depends upon the way in which the draught works and upon the sluice. A wide sluice with a strong draught is the best type. The sluice should be so constructed that all of the logs remain in the water when passing through. At a certain dam the logs enter a narrow sluice with only sufficient water to float them. The waste water necessary to carry the logs over the falls below passes under the dam. There is practically no draught at the head of the sluice and twelve men cannot average to put through over a million feet per day. Another dam has a shallow sluice gate 20 feet wide, with a flaring mouth, and 6 men have easily sluiced a million feet in two hours and a half. On lake drives the men are worked whenever conditions are favorable, and receive straight time. The wind may hold the drive for a week and the loss is made up by night work. Most of the towing, in fact, is done at night when the lake is more often calm. Booms are frequently broken when in tow or hitched to the shore, in which case the crew gathers as many logs as possible before they become scattered. Scattered logs are picked up later in the summer during calm weather and boomed in coves. This operation costs about \$1.00 per M feet.

If logs are landed on the Main River they are driven early in the spring to take advantage of the high water. If no logs are landed there, driving does not of course begin until the tributary drives furnish logs. Booms are used above bad rapids to regulate the logs and to stop them in case of trouble on the falls below, without interfering with the work above. Where there is no sluicing to be done the driving is much less expensive than small stream drives, as

the greater quantity of water requires fewer men. Shallow falls have to be reared up before the logs run over them well. This produces the same result as abutments on smaller streams, but is expensive as it requires much labor on the part of the rear crew to pick off the logs.

The river drivers' wages are from \$2.00 per day for the poorest to \$2.75 per day for the best. Their tools are the 12 foot ash pickpole, and a cant dog with 2½ inch socket and 5 foot stock. Many cant dogs are lost and broken and it is not safe to figure on less than 1½ for each man. The most important part of the cant dog is the hook, which should be constructed so that it will catch the largest log, yet let go easily. It should not be hard enough to break or soft enough to bend under strain.

When logs of more than one company are driven on the same river, the drive is usually handled by a driving corporation and the expenses divided between the concerns interested, in proportion to the amount of timber which they have on the river. The logs of each company are axe-marked or stamped with its registered mark. There are several different methods of sorting logs. On the Androscoggin the river is split by a boom below the sorting gap which consists of a narrow channel between two planked booms through which the logs are passed, the logs of each concern being poled to its side of the river.

Logging and driving become more expensive each year. Good woodsmen and drivers are not so plentiful, wages and supplies are higher, and the standard of living of the lumberjack has risen with that of other classes of men. They demand better working conditions and better food. Meals have increased in cost nearly 100 per cent. These are merely examples of the changes that have occurred and are still taking place. Logging methods have not in this section been improved commensurate with the costs of labor.

PULPWOOD SCALE AND INSPECTION.

BY J. C. CORBETT.

CUTTING.

The first a scaler on a pulpwood operation sees of the pulpwood is after the trees have been cut down and the bark stripped off. The work of felling the trees when they are to be peeled should be performed so as to leave the ground clean. Going over a lot for odd trees left standing is unsatisfactory as well as expensive.

ESTIMATING.

The ordinary method of estimating pulpwood at this stage is averaging so many trees for a cord, the length and size being the principal features, the larger the trees, the fewer required to make a cord. Jobbers usually keep count of the number of trees peeled, and this count verified by the estimator is ordinarily to be depended upon. An aid to bear in mind at this time is the area cut over.

Advancement in the work of sawing the trees into four foot lengths and placing same in small piles to avoid their being buried with the winter's snows bring about the next estimation, as the ordinary contract calls for so much on the peeling and so much on the sawing and piling. A popular way of estimating at this time is in cord feet, that is, a tier one foot in length and four feet high, or vice versa, making a cord foot and allowing eight of the same for a cord. The totals of the piles can be carried along in the head until they aggregate say ten cords, this amount being jotted down. This does away with writing on paper the contents of each small tier, saving a great many figures, which is a big advantage especially on a rainy day. Any deduction to be made in the way of rot or otherwise may be allowed for at the tier where they occur

MARKING.

A very simple and yet effective manner of marking the piles when estimating is by turning a stick crosswise or placing a piece of bark on top of the tier. This marking will save a great many steps in the end and make the estimation more accurate. By so doing the estimator knows at a glance whether or not a tier which appears a little to one side or the other of the direction in which he is traveling has been measured. When doing business with a questionable party, stamping in the woods with a registered mark is advisable, as this secures the wood.

RECORDS.

When more than one drive or much ice trouble occurs on a river great care should be exercised in accepting the wood corded on skids, which in turn should be solid banks, and not simply laid on top of a snow bank, otherwise the results in case of high water are most disastrous, the wood becoming mixed in the drives or going down river before the proper time.

Notes kept during this estimation as to any irregularities of the work, such as the wood being sawed short, poorly peeled, much rot or foreign wood make an excellent check upon the final scale, which is taken when the wood is delivered on the banks of the streams, or, in the case of Railroad wood, at the station, the following winter.

A notebook which has been used the past few winters and found to be of great value is called the Surveyors or Sealers' Memorandum. In this book, which is of convenient size for the pocket, there is a space for the dimensions of the tiers, discounts and allowances and for figuring net cords. If this record is kept, no extra figures need be made, only the old ones preserved. Then if a sealer has occasion to recall past work, which occurs quite frequently, he has only to refer to the original figures taken at the tier.

SCALING AND INSPECTION.

When actual measurements are made every slightest detail regarding the quality and delivery of the wood must be considered. Whenever it is avoidable, two or more tiers should never be accepted piled one against the other, because this gives the vendor or jobber an ideal chance to pass rotten and short pieces of pulpwood, fence rails, stumps, banks of snow, etc., at the current price of pulpwood. Again let us suppose a larger skid is employed on the inside and the small ends of the sticks piled the same way. Then, say that the wood averages eight inches in diameter, six pieces one piled on top of the other will be needed to make a four foot tier. Figuring that there is a difference of an inch in the diameters of the two ends of the sticks, then although the top of the tier may be level there is a difference of six inches or $12\frac{1}{2}$ per cent, in the respective heights of the two sides of the tier. By this I do not mean to say that two tiers cannot be honestly piled side by side, but at the same time I believe in being on the safe side, and that in my opinion is between the tiers. Pulpwood sawed an inch short apparently is a small thing but actually figures out to be a little over two cords on a hundred.

Separating the larger wood from the smaller by placing the big pieces at the bottom of the pile can hardly be done away with, as a Contractor could not justly be expected to lift the heaviest wood to the top of the tier. But on the other hand he should be willing to allow enough extra wood to make up for this method of piling. The smaller the pieces the less wood is contained in a cord, because a greater number will be required, and as each bears its bend or crook, there will be more vacant space. Experiments go to show that where the average diameter of the pieces of one cord are twice that of another there is a difference of 13 per cent, in the volume of the wood.

An easy way of determining the rot is to figure the rotten sticks on the basis of seven inch sticks. As it requires about one hundred 7 inch sticks to make a cord, each one represents one per cent. Red rotted fir especially in rough wood should be discounted completely, for although a small run of sound wood is contained in the stick the chances are ten to one that it will sink before reaching the mill, and even if it does finally arrive it is useful as fuel only. An inch of sap rot on an eight inch stick means a 40 per cent discount of nearly one-half. The same thing applies to a six inch stick with knots an inch long.

In ordinary peeled wood the shrinkage in the diameter due to the process of air drying is about 8 per cent. and as the knots keep their normal length they must necessarily protrude, although at the time the tier was cut they were even with the surface of the wood. Any such knots should not interfere with the piling, as they could be placed in the cracks between the sticks.

Wood poorly peeled, that is when strips of bark are left on the trees, causes very much trouble and expense if it is permitted to reach the mill in this condition. Every effort should be made to have the wood properly peeled before it is landed at the river.

A scaler's trouble seldom arises in taking the length of a tier but usually from the discounts if such are necessary to obtain a sound, merchantable cord of wood as called for by contract. It is good policy to encourage the jobbers to place a little overheight on the tiers, they in turn receiving proper credit for same. By so doing you completely do away with the discount necessary in so many cases for low piling.

Owing to the wood being cylindrical and not squared, a scaler can only rightfully expect about 78 per cent. of actual wood, this varying as above mentioned with the size of the wood. The perfect piece of pulpwood is a straight, sound, handshaved log. In this case the block does not take up space through being crooked or having long knots which would hold it away from the neighboring logs.

The system of feet and tenths of feet in the scaling of pulpwood has an immense advantage over the old rule of 128 cu. feet. The wood being sawed four feet long this dimension need not be used, considering only the length and height of the tiers. The result is in cords and decimals and no fractions appear. This method is advisable when the tiers are of irregular dimensions, as in the case when the wood is corded in cars. Again, if the wood is corded in long regular tiers with a height of four feet, eight feet makes a cord. Any variations in height can be allowed for by using the tenths of feet, each one representing $2\frac{1}{2}$ per cent. If the wood is corded six feet high, 50 per cent. of the gross cords should be added. In a tier of this height each tenth of a foot represents $1\frac{1}{2}$ per cent.

STAMPING.

The stamping of the wood cannot be done too well, as once the wood is scaled and paid for there is no reason why it should not be claimed if it becomes mixed with another company's drive, and this can only be done when the marks show up plainly. The proper stamp hammer is about ten inches long, the shank being turned to $\frac{3}{4}$ inch and weighing about a pound. A hammer heavier than this delays the work and lighter requires too much strength to make the marks discernable after the wood has been driven.

COST.

The cost of scaling and stamping depends almost wholly upon the quantity scaled and territory which a scaler must travel. A fair average cost is about ten cents per cord.



Geo. Horne
1881-date
Edward Gibbons
1889-date

John Delaney
1892-date

O. Goodwin
1886-date
Sheridan R. Lary
1895-1907

SCALING OF LONG LOGS.

BY ALPHONSO CURTIS.

LENGTH.

While in Canada practically all saw logs are cut into 13 foot lengths, in the United States we have no uniform length, and in the Androscoggin Region logs are cut from 10 to 40 feet, depending upon the locality in which they are secured and the size of the stream upon which they are landed. This gives much more work in scaling logs than where they are all cut to a uniform length, as the length of each log must be taken separately.

TIME OF SCALING.

Our scalers commence work at various times between the middle of October and the middle of December. The first going to work on contracts where the scale is to be taken as the logs are landed on the yards, and the last ones on such jobs as necessitate two-sledding and long drags before the logs are landed where the scale is to be made.

EQUIPMENT.

Before a scaler starts on his work he is first instructed as to the details of the contract under which he has to scale, and is furnished with a copy of such portions of it as pertain in any way to his work. In addition to this he is supplied with a scale rule, scale cards, daily summary book, weekly and monthly summary reports, marking leads, stationery, and a tin box with lock in which to keep his records.

SCALE CARDS.

We have in use a form of scale card which is different from those used by any other company, both in form and the manner in which it is used. The scale taken for a log is recorded on the card for the class of wood to which it belongs by means of a punch, which perforates a hole through the required amount, and which insures a permanent record of the original scale made by the scaler, which is not subject in any way to subsequent change. The card is designed to be used for the scaling of different classes of wood, each card representing one class. For example, should a scaler desire to use a card for scaling a fir saw log by the Blodgett rule, he would punch out under the heading "Soft Woods" the word "Fir," under the heading "Scale" the words "Bl'dg eu. ft.," under the heading "Made Into" the word "Saw." On each side of the card there are 5 squares, each square containing five double columns, each double column having one red column numbered from 1-0, and a black column numbered from 1-0. The scaler records on these cards the number of feet which he finds in the logs by means of a special punch. For example should the first log scaled contain 12 eu. ft. he would punch out the "1" in red at the upper left hand corner of the card and "2" in black at the side just be-

low. Each square therefore represents five logs and the ten squares on each card fifty logs. At the bottom of the card there is a square which is used for the total number of pieces, tops, overlength and underlength butts, total cubic feet, board feet and cord feet.

SUMMARY RECORDS.

At the end of each day the scaler copies into the Daily Summary Book the totals as shown by the individual cards for the day's scaling, from which book weekly and monthly reports are made up by him and sent in to the Woods Department office at Berlin, and at the end of the season these totals must agree with the totals of all of the individual cards used during the season, and from which final figures for settlement with the contractor are obtained. In order for the scaler to keep his records accurately and in good shape he should have a small camp for his own personal use, where he can work without having his attention disturbed by conversation or interruptions.

MARKING.

Before logs are scaled the scaler is required to see that they are properly axe marked and stamped as required by contract, that is, each piece must be axe marked on each end with the sign "H," and stamped three times on each end with an "H" stamp axe. After a log has been scaled the scaler indicates having done so by either marking the contents on the end, or by some special mark.

SCALE RULES.

In the measurement of logs we meet with a condition which is peculiar to the lumber business, and that is that we do not have any uniform and standard rule or method for ascertaining the contents of logs, and while several states have adopted a rule to be used as the standard for their particular state, no two of them are alike or give the same results under like conditions.

Practically all rules in use are figured on the basis of showing how many board feet of sawn lumber can be produced from the logs of various lengths and diameters, but while one thousand board feet of sawn lumber always represents the same amount of timber in all parts of the country, a thousand board feet as designating the contents of logs varies greatly in different sections as to the actual amount of sawn lumber which can be obtained therefrom. It would be much more satisfactory if a standard rule were used in all parts of the country, for then the unit as applied would represent the same amount of timber in all places.

BLODGETT CALIPER RULE.

The principal rule which we use is the Blodgett Caliper. Although this is one of the most accurate rules used today, still it is not as accurate as could be desired, as at the time it was designed logs were much more uniform in shape than at the present, and small, crooked logs and top logs were then left in the woods, so that its unit should be revised to meet the conditions as they now exist, when everything in the shape of a tree of sufficient size is taken, regardless of crooks or seams. What we need is a rule based on actual mill measurements of the outturn of the class of logs which are now being received at the mills, and which will give a just and fair measurement for both the log owner and the manufacturer.

In scaling with the Blodgett rule the scaler first measures the length of the log with the measuring wheel, which he then runs back to the center, and at this point calipers the diameter. With the length and diameter determined he can read on the scale of the rule the Blodgett feet contents which a log of its length and diameter contains. 115 Blodgett feet are taken as equivalent to 1000 board feet.

SEASON'S WORK.

A scaler under ordinary circumstances on a job where the logs are brought to one landing and the trees are not too small in size can handle during a season from three to three and a half million board feet of timber.

BOOKKEEPING AND REPORTS.

BY F. W. THOMPSON.

Bookkeeping is defined as a simple science, a system of recording business transactions, and the common understanding of the term is that it is a dry routine of making entries in a set of books or adding long columns of figures. Someone has said, "Bookkeepers are like undertakers—they only officiate post-mortem."

CHARACTER OF PROFESSION.

Now such a conception of bookkeeping and accounting belittles our profession and in no way does justice to the important part it plays in business life. An adequate system of bookkeeping is of the utmost importance in the management of every business, a fact that was never so true as today when credit transactions are almost universal and competition so very keen. Records are a necessity, and the bookkeeper of today fills an important position.

He should have a general and practical knowledge of the entire business with which he is connected and a special training in the accounts pertaining to it. He must bring to bear all the intelligence at his command to meet the varied problems coming before him and a competent bookkeeper comes in closer touch with the working plans, as a whole, of his employer than any other employee.

His work may not show direct profit to the concern—yet if it is carried on in the able and conscientious manner that it should be it will place facts before the employer with which he can increase the efficiency of other departments showing a direct profit. In this way he can save many times the amount of his salary. And on the contrary there is no profession in which the results of careless errors or misstatements will prove more disastrous.

HISTORY OF PROFESSION.

Of the history of Bookkeeping little has been written. When the state of Connecticut included it as one of its subjects for examination for Public Accountants only two authentic books could be found. The origin of the science seems to be lost but just here we call to mind the enthusiastic salesman of a loose leaf ledger whom we heard recently declare that his system was the oldest. He triumphantly proved this by saying Moses started it when he inscribed the Ten Commandments on two slabs of stone.

However, leaving such enthusiasm to the loose-leaf advocate we find it generally conceded that the merchants of Genoa and other cities of Northern Italy first brought the science to a comparative perfection. Double entry was used by them in the early part of the 15th century. The first European who translated algebra from the Arabian language. An Italian friar, Lucas de Burgo—also wrote the first treatise on Bookkeeping, who produced it about 1495.

Following the mercantile trade around the coast it was next used in the Netherlands, then in France and in Great Britain where in time it attained its highest efficiency. English text books are today the recognized authority. Dixsee's Book on Auditing being a notable example of this. It has run through two American editions and stands as a standard in the C. P. A. examination.

American industry has grown so rapidly and broadened into so many new lines that she has had to develop new systems of bookkeeping to meet her varied needs, and during the last ten years the agitation of Scientific Management has introduced new methods. It has become an era of system, each line of business calling for a different range of accounts. A system for a machine shop would in no way fill the requirements of a soap factory, nor will that of a cotton-mill apply to a lumber camp.

To attempt to describe the phases of systems now in use would be impossible in our allotted time and foreign to the object of this Convention. Hence we will confine our discussion from this point to the particular form of accounting that concerns the Woods Department.

BUDGET.

The best results in any undertaking spring from a definite plan—so at the beginning of each seasons lumbering and pulp wood operations such a plan is made—a Budget in other words. We are best acquainted with this term in city and national government where each year appropriations are made to conform with their needs. Their Budget contains two leading elements, viz:—a statement of how the accounts of charge and discharge stand with relation to the past, an explanation of the probable expenditure for the future and a scheme for meeting its requirements. The Budget of the Woods Department is planned along similar lines and is an important and valuable book of information. It is under the direct supervision of the General Manager.

It considers

First:—How much timber and pulpwood do we require to operate our mills?

Second:—What is the source and means of supply?

Third:—What is the estimated cost, in detail?

Fourth:—What is the duty of each man in obtaining the desired results?

With these general headings in mind a plan is worked out in detail for each individual operation with the assistance of the local managers and a copy is handed to each local manager as a guide for the coming season. This copy also serves as a guide to the local accounting department in establishing the headings for the different accounts, as it is made in the form of a statement using the estimated figures.

SYSTEM OF BOOKS USED

Each geographical district maintains an office and staff and conducts its business individually along similar lines, but as the volume of business and local conditions vary to a great extent it is difficult to maintain a strictly uniform system of bookkeeping throughout.

But as the general principles must remain the same throughout the different operations a pliable system of accounts gives us the information needed

to make up the final reports. The main features of this system we will outline as briefly as possible.

Each office has a complete set of books—a Journal, Cash Book, Paid Register, Invoice Register, General Ledger, Accounts Receivable and Payable Ledger, and Jobber's Ledger, with a Real Estate Book and Contract Book as auxiliaries, and sundry Time Books, Scale Bills, etc.

HEADINGS.

The sources of information which form the foundation for the general set of books may be roughly divided into four heads, viz:—

Labor, as recorded in the Pay-roll books,
Supplies, as purchased and handled through the Storehouse,
Measurements, as reported on the Scale Bills,
Miscellaneous Expenses, as recorded on the Expense books, Legal bills,
etc.

LABOR.

The Pay-roll Books vary in size and form according to the operation and pay-roll period. At the close of each Pay-roll period which varies from one or two weeks to a month or in the case of the drive ends with the drive, the completed pay-roll is entered on the regular books crediting full amount to the Pay-roll Accrued Account and charging same to the different operations. All labor must be entered on these Pay-roll books and is paid for by check, orders, or merchandise.

SUPPLIES.

All supplies must be obtained on a written order of the purchasing agent. They must also be billed direct to the Company. As received they are checked and invoice approved. If supplies are for immediate use they are charged to the operation directly from the bill, but if for future use they are placed in the Storehouse and charged out from there as used on Storehouse slips used for this purpose.

MEASUREMENTS.

Let us take a little extra time to describe the use of the Scale Bill and its importance as a foundation for the Pulpwood Accounts. When the first advance for peeling wood is due the jobbers, the scaler makes an estimate of the amount peeled, enters it on an Estimate Slip and forwards this to the office where it is approved by the local manager and entered by the bookkeeper on the Contract Book in a Memo column ruled for this purpose. On this estimate the jobber receives his advance according to the terms of the contract. This process is repeated from time to time through the peeling, cutting, and piling season. When the wood is delivered at the station or river bank as the case may be, it is then scaled and stamped, a Scale Bill is made out showing date, number of cords, kind, whether peeled or rough, and where cut, whether on own lands or purchased from outsiders. This is signed by the scaler, sent to the local office where it is checked with the contracts, and the price extended. It is approved by the local manager, numbered, and entered on the Invoice Regis-

ter crediting it to the jobber in the special column headed Jobbers' Ledger and charging the proper pulpwood account. Deducing the advances already made, the balance due is paid the jobber.

CONTRACT BOOK

It is the bookkeeper's duty also to enter the Scale Bill on the Contract Book and also on what we term a River Book, which shows at the end of the season the amount of wood delivered on each River or at any Railway station.

We have described this process minutely to impress upon you a fact often overlooked, that the scaler is the original bookkeeper and fills a most important position. We have tried to make it clear that the Accounting department has to rely on his figures as a foundation for the measurement and the Company depends upon the accuracy of his scale for making all payments.

The following describes briefly the usage of the general set of books:

JOURNAL

The Journal is the book in which are recorded the opening and closing transactions of the business together with any necessary transfers between the accounts. At the time of the purchase of a new property a complete inventory is taken and this is classified into the different appropriate headings, viz:—Timberlands, Mills and Machinery, Real Estate and Houses, and Miscellaneous Inventories. This classified inventory is sent to the general office entered on their books, each item charged to accounts bearing the same name except the item Miscellaneous Inventories which is charged direct to the new local office. With this item the local office starts their books dividing it into proper accounts, viz:—Horses, Wagons, Harness, etc., are put into an account called Horses and Equipment, Tools and Supplies used on the Drive into an account called Driving Tools and Supply Account and so on. These entries are made in the Journal as the opening entries.

CASH BOOK

The Cash Book is the book in which all cash transactions are recorded. A suitable amount of cash being deposited in a local Bank, the Cash Book is opened with this item crediting Berlin Office and charging the Bank through the special column ruled for the purpose. All cash transactions being made through the Bank the Cash serves also as Bank Book.

INVOICE REGISTER

The Invoice Register is a book in which are entered all invoices of purchases including the scale bills for pulpwood. It has ruled columns to shew date, number of invoice, name of party purchased from, amount, and columns for the different ledgers in which the items are to be posted on the credit side. The debit side has a number of columns headed with the different improvement, Inventory, Pulpwood, and Expense accounts that are carried in the General Ledger, and all purchases of supplies and pulpwood are distributed through these columns, added and carried forward through the month, posted at the end as one amount. This saves endless postings.

PAID REGISTER.

All outside purchases such as Driving Supplies, Machinery, etc., should be paid for by check from the general office. After payment the invoices so paid are to be stamped with date and voucher number, returned to the local office and entered consecutively according to voucher number in the book we term the Paid Register. Amounts thus paid are credited the general office and charged to parties receiving the check.

The above mentioned books are specially designed with specially ruled columns to carry what we term Controlling accounts. For Example—in entering Scale-bills on the invoice Register they are extended into a column headed “Jobbers’ Ledger Account” and all items extended into this column are posted in detail to the proper accounts in the Jobbers’ Ledger, while the total of the column is posted into a Controlling Account called the Jobbers’ Ledger” in the General Ledger. This principle is followed in all the books and saves a great deal of time when making up the trial balance for the head office.

ACCOUNTS RECEIVABLE AND PAYABLE LEDGER.

The Accounts Receivable and Payable Ledger should carry all accounts receivable and payable other than the Pulpwood Jobbers’ Accounts.

JOBBERS’ LEDGER.

The Jobbers’ Accounts are to be kept on a separate ledger containing nothing else and which is termed the Jobbers’ Ledger.

GENERAL LEDGER.

The General Ledger (Form No. 12) contains all Real Estate, Construction, Cash, Inventory, Expense, and Profit and Loss accounts together with controlling accounts for “Accounts Receivable and Payable Ledger” and “Jobbers’ Ledger.” The foregoing books contain the Bookkeeping proper. In addition to them two auxiliary books are desirable used for information only, the Contract Book and the Real Estate Book.

CONTRACT BOOK.

As Pulpwood contracts are signed and handed to the Bookkeeper he numbers them and enters a brief in a Contract Book which gives date, number, contractor’s name, amount, location, where delivered, price and terms, together with any further items of importance. As the season progresses this book is kept up-to-date, entries being made to show fulfillment of contract and payments on same.

REAL ESTATE BOOK

The Real Estate Book is a loose leaf book containing a record in detail of all the properties in each district purchased by the Company. It shows the date of purchase, Lot and Range number, Township, from whom purchased, previous owners, estimated amount of timber if any, taxes, and also a record of the timber as cut if any.

TRIAL BALANCE SHEETS.

At the end of each month a Trial-balance is drawn off from the General Ledger and sent to the general office. This is the principal Report. As stated the Budget has outlined in a general way the information the management

requires and the accounts on the General Ledger should be arranged and classified to furnish the information in this order readily. Reports are the means of supplying this information to the management from time to time.

The term "Reports" brings to mind one of Mr. Carter's famous stories. A certain railroad superintendent issued instructions to his foreman to the effect that they must make written report of any unusual occurrence on their division. Soon after this edict an accident occurred on one of the divisions. The foreman, Lannigan, by name, sent in an exhaustive report of several pages telling how the train went off the track and minute details of how it was put on again. This report was rather too much for the superintendent, he had no time for reading such a document, so he wrote Lannigan to cut down his reports to simple facts. Soon another train jumped the track. The report this time was short and to the point, it read, "Off again, on again, gone again, Lannigan." This goes to illustrate that reports like everything else must strike a happy medium.

The monthly Trial balance as above stated forms the main report and shows in totals the principal items of expense. Each item is or should be substantiated by a supplementary statement showing the detail which goes to make up the total.

CONSOLIDATED STATEMENTS.

The Trial balance and miscellaneous Reports coming into the Main Office from the different offices are made into a Consolidated statement, showing the results of all their operations as one.

FIRST HAND KNOWLEDGE.

From the above outline you can readily see the importance of each Bookkeeper understanding thoroughly the classification of his accounts and the importance of keeping them in uniform order as scheduled. This also applies to the information that goes into the accounts, that they will contain the same information in the different districts in the same order so as to furnish a fair comparison of costs. He should understand the actual conditions and performances of each particular piece of work so that when he enters this information on his books it goes into the proper accounts and when his accounts are analyzed they will contain "the truth, the whole truth, and nothing but the truth." The Bookkeepers at distant local offices, unlike the bookkeepers of large concerns in the cities, come in direct contact with the people with whom they do business and are really assistants to the local managers.

The local manager should remember that his bookkeeper is not a mind reader and should give him his co-operation by furnishing him ALL the necessary information connected with each transaction.

ACCURACY.

All this means hard work but as the late Thomas B. Reed said, "There is no genius except the genius of hard work." A good point for the Bookkeeper to remember is that his thoroughness and accuracy are the foundation of his own success; carelessness and slipshod methods react against himself as well as against his employer.

When it comes to a question of promotion the most indispensable quality is LOYALTY because that is the very foundation of confidence. An employer often overlooks blunders and inaccuracies if his men are true and loyal.

AGENCY AND CONTRACTS.

BY JOHN P. WELLS.

Agency and Contracts are two subjects about which a great deal might be said.

In order to go into the law of Agency with any sort of closeness, many different classes of the contract would have to be dwelt upon. To illustrate to you how much could be said about the law of contracts, I need only to state that the last edition of a work on Contracts consists of four large volumes, each about 4 inches thick. These introductory remarks are not, however, intended to convey the impression that you will have to face a digest of the entire law of Agency and Contract. This paper will deal simply with the elementary principles of the law with respect to these two subjects, and my endeavor has been to put in into such shape that the paper will be easily understood and the information contained will be of some practical use.

AGENCY DEFINED.

Agency is defined as being a contract by which a person called the Principal commits a lawful business to the management of another called the Agent, who by his acceptance obliges himself to perform it.

Under this contract it will be seen that two sets of obligations arise. Firstly: The obligations of Agent; Secondly: The obligations of the Principal. These two sets of obligations will be treated separately.

OBLIGATIONS OF AGENTS.

The obligations of the Agent may be divided into two sets:

First: His obligations towards the Principal.

Second: His obligations towards third persons.

Speaking in a general way, the acceptance of agency obliges the agent to carry out its execution.

TOWARDS PRINCIPAL.

In the Province of Quebec the law specifically provides, that while his authority continues the agent is liable in damages towards the Principal for non-execution of his agency.

The first question that would naturally arise in the mind of the ordinary individual would be: If there is such a hard and fast obligation on the part of the agent, to what extent is he held in the execution of the contract? Is he liable for every mistake, error of judgment, and in such cases is he bound to pay to his Principal whatever damage may be sustained?

To this question the answer is: That the agent is bound to exercise in the execution of the business reasonable care and skill and all the care of a prudent administrator.

As long as an Agent carries out his contract in a fairly faithful manner, and gives what we would call businesslike care and attention to the work, his Principal would have no action for damages against him.

TRANSFER OF AUTHORITY.

It sometimes happens that an Agent in the carrying out of his contract substitutes someone else in the execution of the business. When this happens, he is answerable for the person who he substitutes, unless he has special authorization to make such substitution. The Agent would be answerable in any case if the person whom he substituted be one notoriously unfit. The remaining obligation of the Agent towards his Principal is to render an account of his administration.

TOWARDS PUBLIC

We now come to consider the obligations of the Agent towards the public.

If the Agent acts within the bounds of his authority and in the name of the Principal, he is not personally liable to third persons with whom he contracts.

If an Agent should act in his own name in carrying out certain business, he would be liable personally to the third party with whom he contracts, and in addition to this the third party would have a claim against the Principal itself.

The cases in which a large number of disputes as to whether the Agent is liable personally to third parties or not, are those in which the question as to whether the Agent has exceeded the scope of his authority comes into question. When this question is raised and it is proved that the Agent has gone beyond the bounds of his contract, or exceeded the scope of his authority, he is held to be personally liable towards third persons with whom he has made any contract.

This question as to whether the Agent has exceeded his powers or not comes up in a great many different ways, and the holdings as to personal responsibility are governed, of course, largely by the acts of each particular case.

Another class of cases in which the Agent is held to be responsible is that where the Agent makes the contract without disclosing the fact of his agency. If he fails to disclose the agency, he becomes subject to all liabilities, expressed or implied, created by the contract, in the same manner as if he were the Principal.

OBLIGATIONS OF PRINCIPALS.

We will consider now the obligations of the Principal, but will treat them only in a general way.

There is the direct obligation to indemnify the Agent for all obligations contracted towards third persons within the limits of his powers, and even if the Agent should happen to have gone beyond his powers, the Principal is liable whenever he has expressed or tacitly ratified these acts. The Principal is subject to the same obligation in favor of third persons.

GENERAL POINTS.

The above outline of the duties and responsibilities of Agents are practically the same under the laws of Canada and of the United States. The provisions of the laws of both countries are based upon the principles of English law.

On going through the law of Agency as laid down by United States authorities, I find practically no difference so far as the general formalities of the contract are concerned.

Before closing it might be well to draw your attention to the following: Minors being incapable of contracting cannot appoint an Agent, neither can married women. On the other hand, the Agent does not require the same qualification as the Principal, and minors, married women, aliens, etc., may legally act as Agents and bind their Principals.

In case an Agent should be in doubt as to whether any proposed business came within the scope of his authority or not, and the matter was in any way important, it would always be the policy of wisdom to get his Principal's authority if such a thing were reasonably possible.

CONTRACTS.

We will now give a few moments consideration to the question of contracts.

There are four requisites to validity of a contract. Persons legally capable of contracting, their consent legally given, something to form the object of the contract, and a lawful cause or consideration.

CONSIDERATION.

In ordinary business life the last one is sometimes forgotten. For example, if you happened to be taking an Option for the purchase of a tract of land, or for some timber, the form of the contract is very simple, and the man is giving you an option, we will say, for ten days and charging you nothing for it. In drawing your Option you should nevertheless put in a clause that the contract is made for and in consideration of the sum of One dollar, and other good and valuable consideration.

I am using the contract of option to illustrate this, because it is one that often arises, and a contract in which the consideration might often be lost sight of, or not thought of.

This doctrine applies as well in the States as in Quebec, both countries, in a general way, treating a contract as being an Agreement upon sufficient consideration to do or not to do a particular thing.

VERBAL AND WRITTEN.

From what has been already said, and from the above definition, you will know that the contract is the Agreement itself, whether verbal, written or otherwise. A verbal contract is just as strong and just as binding as a written one, and may be enforced in the same way, provided the Agreement can be proved.

A great many people have the idea that because no writing exists there can be no contract. As we have already noted, however, the writing itself

is not the contract, it is merely the evidence of it, and the written contract is much more easily proved than the verbal one.

Before going any further it might be desirable to refer to the form of contracts.

FORM OF

Contracts in writing are subject to no particular form so far as words are concerned. It is true that in a Deed of Sale for instance, the Vendor is made to say that he does sell, transfer, assign, convey and make over. If only the word "sell" were used, there is no doubt the contract would have the same effect.

In the olden days, when more attention was paid to form and formality, the omission of certain words from contracts was in many cases fatal, but that has, to a certain extent, disappeared, at least in the Province of Quebec. The more simple contracts can be made, the better. A written contract signed by the parties thereto is sufficiently executed.

CONCERNING REAL ESTATE.

In the Province of Quebec, however, in order to have any effect so far as real estate is concerned, such a contract must either be drawn by a Notary, or be signed by the parties in presence of two witnesses. One of these witnesses must make an Affidavit that he saw all the signatures to the contract written in his presence, and that they are in the true and proper handwriting of the parties, and a registrar will not receive and register any document affecting real estate, unless it is notarial, or executed before two witnesses.

NOTARIAL AUTHENTICITY.

Here you might note that in the Province of Quebec, if you have in your hands a copy of a contract certified by a Notary, you are in possession of an authentic document, that is to say, a document which makes proof of itself in any Court. If you wish to base an action upon the copy, you would neither have to prove that it was signed by the parties, or that the Notary's signature is genuine.

WITNESSES.

You will see therefore, that witnesses are necessary in connection with the contract only in the following cases:

First—Where the contract is verbal, their evidence goes to prove the Agreement, and will prove the Agreement, provided that the contract is of the nature that admits of verbal testimony.

Second—Written contracts require witnesses only when the contract affects real estate, and has to be registered. When you know that the signatures to a written contract are not forged, there is no necessity of witnesses, except as above mentioned, when the contract affects real estate.

REGISTRATION.

As a general rule in the Province of Quebec, contracts do not have to be registered unless they affect real estate.

MOVABLES.

In the United States a man may execute a Chattel Mortgage, and thereby hypothecate his movables. No such contract is allowed by the law of the Province of Quebec. We have, however, a system which is very misleading, and a knowledge of which is desirable.

A has a team of horses, which he wishes to sell B, but is not satisfied with B's financial responsibility. He cannot sell the horses to B and take a Chattel Mortgage on them, but he can either give B the possession of the horses under a contract by which B acknowledges that he only has the possession and that he will not become owner thereof until the price is paid in full, or can give B the possession of the horses and B can execute a lease by which he acknowledges he is leasing them from A.

B may take these horses and have them for a year or so, and make a pretended sale of them. A, however, can seize the horses in the hands of the third party, and regain possession of them, he never having parted with the title.

Possession of movables in the Province of Quebec therefore, is not a guarantee of good title, and in the United States, I understand that there may be Chattel Mortgages registered against movables. In the Province of Quebec, therefore, when buying movables of any value, it is necessary that you assure yourself that the possessor is actually the owner of them, or that the man who wants to sell to you is financially responsible, and would be liable to you for damages in case the sale was set aside.

OVER \$50 IN VALUE.

In the Province of Quebec never make a contract where the value of the thing is over \$50.00, unless you have it in writing. If you have not got your contract in writing, you will have to prove it by testimony, and that cannot be done, except:

First—In all cases concerning commercial matters, that is to say, between traders in ordinary commercial business.

Second—In all matters where the principal sum does not exceed \$50.00.

LEGAL PARTIES.

In the United States and Canada the capacity of parties to contract is practically the same. Contracts cannot be made by minors or married women.

The consent required to validate a contract is presumed when the contract is in writing, and has been signed, and once signed, unless the signer proves fraud, it is a conclusive presumption that the signer read, understood and assented to it. Contractual relations are established in two ways—by acts of the parties and by operation of law.

The acts of the parties required to complete a contract are "offer" and "acceptance," or by such conduct as implies a meeting of the minds with intent to contract.

The offer, no matter how made, does not bind the one who makes it, until the one to whom it is made accepts it, and unless the offer has been with-

drawn, it is deemed to continue in force until it has been answered. Once refused the offer can no longer be made the basis of the contract between the original parties.

IMPLIED CONTRACTS.

There is a class of cases where the law prescribes the rights and liabilities of persons who have not really entered into any contract at all with one another, but between whom circumstances have arisen which makes it just that one should have a right and the other be subject to a liability similar to the rights and liabilities in certain cases of expressed contract. Contracts of this character are called implied contract. An instance of such a contract would be assuming management of any business, or receiving what is not due, etc.

SEALS.

In the Province of Quebec the affixing of a seal is not necessary to the execution of a contract. We might make one exception, and that in cases where contracts are made before Notaries the Notary does affix his seal, but the reason for this is to complete a set of formalities in connection with the execution of an authentic document.

You will remember that I referred before to the fact that a notarial copy of any document makes proof of itself before any court of record, and this document has to bear the seal of the Notary. Aside from that we have no use for seals. I am speaking, of course, in a general way, and not referring to the contracts between stock companies, who usually provide by their By-laws that the Company shall have a seal, and in cases where these bodies do have a seal, we require that the Secretary use it in signing on behalf of the Company. I doubt very much, however, if its absence would nullify any contract.

In the United States it would appear, however, that the seal is necessary, but it is held that anything in the nature of a mark will make a good seal; for instance the letters "L. S.," or the word "Seal," or a piece of paper.

The use of seals, however, in the States, appears to be the subject of Statutory regulations, both as to the form and the necessity for use. It would be impossible, therefore, for me to give any general idea as to what is required, each State being different in its provisions.

AVOIDANCE OF LAW SUITS.

It is difficult, and indeed almost painful, for the speaker to refer to one of the principal objects of this Convention, namely, the cutting down of expense in the different departments.

A great many concerns believe in the doctrine of going to your lawyer early and often, arguing that it pays in the long run.

In the Province of Quebec your first aim should be to get a settlement of any disputed matter before your opponent goes to see his lawyer.

In these days, however, any up-to-date law office specializes in making settlements and at least one of the members of the firm should be a man who has had experience in that direction. If you cannot make your settlement yourself, you will find in a great many cases that you will save money by getting

your own lawyer to deal with the individual. If you wait until your opponent goes to see his lawyer, the chances of settlement are smaller and the expense also is certain to be greater.

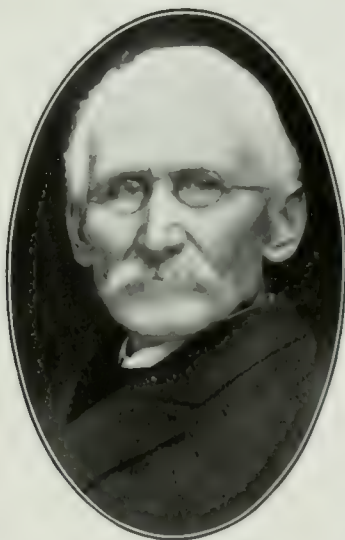
COSTS OF SUITS.

Our system in Quebec is different from that in the New England States so far as costs are concerned. The loser not only has to pay all Court costs but the lawyer's fees on both sides, and in cases of dispute over ordinary business matters it is of considerable importance to use every possible means of avoiding being sued. Of course in many cases it is considered wiser to allow the suit to be issued, but take it as a general rule, avoid being sued if at all possible.

COLLECTION OF EVIDENCE.

Another point to which I would draw your attention is this:—when ever you are met with a possibility of a law-suit, or a contestation, get your evidence in shape right off. Cases are lost or won when the evidence is being put in.

You know how Railway Companies, Street Railways, etc., when an accident happens, immediately go to work to get all the evidences possible that will help them. Why should you not do this as well? If an accident happens, or if a dispute arises, make preparations at once, and secure your evidence, and do not wait for the trial, which may possibly take place a year or two years later, when the task of securing your evidence is rendered much more difficult.



Alphonso Curtis
1895-date

J. A. Keenan
1896-date

A. M. Carter
1896-date

J. Murray
1896-date

A. J. Lary
1896-date

BUSINESS FUNCTIONS OF A QUEBEC NOTARY

BY REX MEREDITH

HISTORY.

In the first place it must be remembered that the Province of Quebec, as far as civil law is concerned, is still governed practically by the same laws as were in force when the English took Canada from the French in 1759, and by the Treaty of Paris then passed, the Laws and Religion of the country were not changed and special permission was given to the twenty-one Notaries then practising, to continue their profession. The people were allowed to retain their language, which still ranks concurrently with the English in the Courts of the Country.

TRAINING.

To be admitted to the practise of the Notarial Profession, a man (no females are admitted) must first obtain a Degree of Bachelor of Arts or pass an examination to permit him to study, after which he follows a three years' law course at the University, at the same time being indentured to a Notary, at whose office he is expected to attend daily in order to gain a practical knowledge of his work. At the end of three years, if he has successfully passed his University examination, he has to pass a final examination before the Board of Notaries, before being allowed to practise. Once admitted he is entitled to practise during his lifetime, unless deprived of office by a ruling of the Board of Notaries, which is most exceptional.

PROTECTION.

He is considered as a public officer of the Country, is exempt from service on juries and the like, and is protected in the performance of his duties, in that any person molesting him is considered as having committed a criminal offence, for which special punishment is provided.

AUTHENTICITY OF DEEDS.

The difference between a Notary and a Lawyer is perhaps worthy of consideration, as many people are apt to confuse the two. The most essential is that the latter's chief occupation is pleading in Court, which is entirely outside the duties of a Notary, although he is allowed to plead in minor matters before a judge in Chambers. On the other hand the Notary has the power of "passing" or "executing" deeds or documents, which are considered in all Courts of the Province as authentic, that is to say, no proof of their execution, or the facts contained therein is necessary; this which is really the Notary's chief power is entirely denied the Lawyer. Since 1785 the same person may not practise these two professions at once.

The Notary's chief function then is drawing up deeds, generally referred to as "Acts" which are completed and given their character of authenticity by being "passed" or "executed" before the Notary; it is essential to the validity of the deed that all the parties sign, either personally or by Attorney, in the Notary's presence.

PERMANENCY OF DEEDS.

The deeds thus passed are individually known as "minutes" or "records," and collectively as a "greffe." Special provisions are set forth in the law whereby the greffe must be kept in a dry, fireproof vault, in good order and open at all times to inspection by an officer of the Board of Notaries. The sort of paper and ink to be used in preparing deeds is also prescribed by law, but unfortunately, in the country parts, many deeds have been prepared on most inferior paper and with bad ink, and as a result many have become in course of time almost, if not quite illegible.

Upon the death of a Notary his "greffe" is handed over by his heirs to the Superior Court of the District in which he practised, and his heirs are entitled for a certain time, to a proportion of the fees which are obtained by the Court from issuing copies of his deeds. It is also lawful for a Notary to dispose of his "greffe" by will, in favor of another Notary, who, before taking it over has to be authorized by an Order in Council of the Lieutenant Governor of the Province. There are many formalities to be observed in connection with the transfer, and a record is taken of any deeds which may be missing, as well as whether any are torn or otherwise imperfect.

EXECUTION OF DEEDS.

Notarial Deeds may be executed in two ways; "en minute" in which case the original deed must forever remain of record in the office of the Notary, and "en brevet" or "in original form," which are simply signed by the parties in the presence of the Notary, who also signs and delivers the original to the parties—this form is frequently used for Powers of Attorney, Declarations and other short, unimportant documents.

Copies of the Notary's deeds, certified by him, or copies of deeds from the "greffe" of a deceased notary certified by the Notary who has the possession of them, are authentic, and make proof of their contents to the same extent as if they were the original deed itself. No proof is needed as to the signature of the Notary to the copies.

CHANGES IN DEEDS.

Any additions or alterations to be made to a deed as at first written, must be added in the margin and initialed by all the parties and the Notary, and mention of the number of "marginal notes" as well as of the number of "words struck out" must be made at the foot of the deed. Once a deed has been executed it can only be changed by another deed executed between the same parties. And a Notary may on no pretext whatever allow his original deeds out of his possession without an order of the Court authorizing him to do so.

FILING OF DEEDS.

All deeds passed "en minute" are numbered consecutively and entered in a Book called a "Repertoire," in which is given the number, date and nature

of each deed, and the names of the parties to it; and in order to facilitate the finding of the deeds the names of all parties are entered in an alphabetical "index," with the number of each deed in which each party is interested entered after each name.

By far the greater number of deeds are passed "en minute," by reason chiefly of the advantage it affords in having the original deed kept in safety in the office of the Notary, where there is no chance of it being lost, destroyed or tampered with—where access to it can readily be had by all parties interested, and if necessary as many copies as required given by the Notary.

KIND OF DEEDS.

Owing I suppose chiefly to the favor with which the Notarial Profession was regarded in France the following deeds must be passed before a Notary "en minute": Donations, Wills in authentic form, Marriage Contracts, Conventional Hypothecs, mortgages—except in part of the Eastern Townships, Renunciations to Successions and Communities, Inventories and others of somewhat less importance; and it is also provided by the Code that a proprietor has a more extended privilege on the effects of his tenant, in the event of the latter failing, if the lease has been made in Notarial form.

Protests of Notes, Bills and Cheques, Significations, Legal Tenders, Notifications and similar deeds are also made by a Notary and have the same character of authenticity as the others.

LEGAL TIME OF MAKING

To the contrary of what you might expect, a most ail deeds may be legally executed on Sundays and Holidays, and if passed on those days must be so dated.

The object of this is to allow the "habitants" in the country parts to transact their business when coming to church, near which the Notary generally has his office, thus saving them long drives over roads, which in most parts, are at times almost impassable. Court House business and deeds of a disputable (contensieuse) nature, cannot however be legally passed on Sundays or Holidays.

WILLS

To a non resident of the Province of Quebec, the most striking deed which a Notary can make, is doubtless the authentic will. It is made in the presence of two Notaries, or one Notary and two witnesses, it must be read aloud to the Testator by one of the Notaries in the presence of the other, or the witnesses as the case may be, and after being signed by all is received as an authentic deed, and after the Testator's death, no probate or other formality is required—certified copies being all that is necessary, or can be asked for. To any one who has experienced the delays and expense of the Probate Court, the saving of both time and money is apparent.

MARRIAGE CONTRACTS

The marriage contract is also a survival of the ancient laws and customs of the Country. To endeavor to explain its complications to you, would be but to wear your patience. Sufficient to say that two persons marrying under our law, and not signing a marriage contract, are provided with one by the

law, whether they like it or not, and of a kind, which, in these days of business, is considered far from satisfactory. It is essential to this document, that it be executed before marriage, cannot be changed after marriage, and the dispositions contained in it take precedence over a will. Its importance, while often not taken sufficiently into consideration, is self evident.

DONATIONS.

Another document which is in more favor in the country parts than in the Cities is the Donation (*entre vifs*,) it being customary in many parts of the Province for the father of a family to divide up his estate, before his death, in this manner among his children, generally on condition that each child helps to support the parent by providing him board, lodging, clothing and so forth, even obliging some of them to pay his expenses of funeral and burial. This procedure also provides a means of escaping Succession duties, of which the country people seem to have even a greater hatred than the ordinary mortal.

DEED OF SALE.

The deed which is most frequently in use however is probably the deed of Sale, although it does not necessarily have to be executed in Notarial form. A great objection to its not being executed in this form being that the Register must have the signature to it attested, before he can register it.

VALIDITY OF TITLE.

When a Notary is asked to prepare a deed of sale he should be furnished with all the title deeds to the property, as well as a certificate from the Registrar, in whose division the property is situate, showing all entries in his Register against the particular property. The deed should be prepared so as to show all servitudes against the property and other conditions in former deeds affecting it, as well as giving any new conditions which the parties care to insert.

RESPONSIBILITY FOR TITLE

The notary is only responsible for drawing up and executing the deed, and has no responsibility as to the validity of the title to the property unless he has been expressly asked to look into it. It is generally understood, however, that he should do this, and although not legally bound to do so, a Notary always looks into the title and advises the Purchaser if he sees any reason for considering it imperfect.

NOTARIAL PROTEST.

The service of Notifications, Protests and the like are purely Notary's work and these documents when served, make proof of their contents until denied or proved false by the adverse party—their chief value is in the putting in default of the person on which they are served.

Ships protests, made out by the officers of a ship which has suffered damage, in order to establish who is responsible for the same; Bank protests and others which are in use in the United States are all made out by the Notary, and are authentic, when completed with the required legal formalities.

ESTATES

The winding up of Estates is a business which by custom is left practically in the hands of the Notaries, although there is nothing essentially Notarial about it, and many Notaries also practically make a business of acting as Executors and Trustees, although much of this work is now being handed over to the Trust Companies.

DIFFICULTY OF BREAKING

In the event of a party wishing to have a Notarial deed set aside by reason of something false therein, he can only do so by taking an Action in Improbation (inscription en faux) which is so complex and costly as to be rarely resorted to.

RENUMERATION

The remuneration to which a Notary is entitled for his services is established by a tariff fixed by the Board of Notaries, and if he charges more than he is allowed he may be sued in the ordinary course. There is also a tariff of minimum charge, below which the Notary is not allowed to agree to work, under penalty of suspension.

I have endeavored to briefly set before you in general terms, without going too much into details and exceptions, the most striking peculiarities of this Profession which is almost unknown outside of the Province in which it flourishes.

RAILROAD TRANSPORTATION AND TRAFFIC.

BY D. W. LINTON.

GENERAL BEARINGS.

The transportation or the distribution of the numerous products of food, fuel, raw material and manufactured products is a matter of universal interest, comprising as it does perhaps 30 per cent. of the cost of all goods to the consumer, practically regulating the life of many industries and growing in National importance from the time the first locomotive was built in 1804 in London of 5 or 6 tons drawing ten or a dozen light weight cars; to the present time (a hundred years of improvement) when our modern type of engine of 75 tons draws from 50 to 100 heavy weight cars and strains the full limit in strength and safety of the steel rails.

It is for this reason that States have been led to adopt Railroad Commissions to regulate the controlling factor in their business prosperity, and the General Government has established an Inter-state Commerce Commission with wide powers, and that it is necessary for large concerns to watch carefully this essential element of cost.

ORGANIZATION.

The Directors place the responsibility on the president who in turn appoints Vice Presidents of various Departments as follows: Legal, Land Tax & Claims, Financial and Accounting, Transportation, Maintenance and Construction, Purchasing, Medical and Traffic.

The Vice President of each department is held strictly accountable for its working arrangement.

We are chiefly concerned with Transportation and Traffic. The Vice President of the Transportation Department is the most important in that he is practically the General Manager, and does the driving so to speak. He appoints Superintendents of the different divisions—Superintendent of Car Service, Train Masters, Chief Train Despatchers, Road Masters, Station Agents and so on.

The Traffic Department sells to the Public transportation, and pays the bills of that department, and that department (Transportation) must keep up its rolling stock with sufficient locomotives and cars to meet the demands of the Traffic Department. The trains are made up by Chief Despatchers, the number of cars to a train being determined by the hauling capacity of the locomotive, each locomotive is classified and posted in the office of Despatchers. So it all depends on the road beds, bridges, weight of steel rails, and grades, as to heaviness and power of locomotives. During the winter season when the weather is very severe the hauling capacity is depreciated from 20 to 40 per cent.

REST TIME.

The Railroads are also subject to the 16 hour law for its men. It very often happens that trains are held up 8 hours for rest, thus throwing the working machinery out of gear, and causing delays in placing empties and pulling out loads at different stations.

RATES.

The rates for goods offered for transportation are made up by the Traffic Departments, and is an interesting problem—some figure on what the traffic will bear, or the relation of one rate with another between terminal points, others so much per ton mile, but owing to an Act to Regulate Commerce by the United States Government, creating an Interstate Commerce of seven members, with headquarters at Washington, D. C., just and reasonable rates are more strictly adhered to than in years past. All tariffs showing rates are sent to the Commission for approval and must be posted from 35 to 40 days before allowing them to go into effect, if at all.

CLASSIFICATION.

All goods offered for transportation are classified from A to Z in seven different classification books, as follows: Official, Western, Southern, Illinois, Iowa, Texas and Canadian. A movement is now on foot, however, to provide a Uniform Classification to apply all over the United States, and is an immense task, a Committee of 5 members being appointed for that purpose with headquarters in Chicago.

In the Official Classification and the Canadian Classification we are chiefly interested.

The Official is made up by a Committee of 14 members representing all Railroads east of the Mississippi and north of the Potomac, and takes in Six Classes from A to Z subject to the approval of the Interstate Commerce Commission.

The Canadian Classification is made up by a Committee of 7 members, representing all roads in Canada, and takes in 10 classes from A to Z, and is subject to the approval of the Canadian Railway Commission with headquarters in Ottawa.

SHIPPING RECEIPTS.

When goods are offered for shipment, the Shippers are furnished with blanks in triplicate called shipping receipts, which must be carefully filled in by showing plainly, Car Number and Initials, Names of Shippers, to whom shipped and Destination, Rates and Routes. Misdescription of property for transportation is liable under the Law to severe penalty for each offense.

CONSULAR INVOICES.

If from points in Canada to points in the United States in addition to shipping receipts, the Shippers will have to buy a Consular Invoice for \$2.50 from the nearest American Consul, giving particulars as to Valuation, amounting to \$100.00 or more.

Care should also be taken to show as many cars as possible on one invoice in order to reduce the expense of Consular Invoices. It will be perfectly proper in this connection, when the wood is from same shipper to same con-

signed, to make out bi-weekly Consular Invoices from points on the same road in a direct line, but the cars must reach the Port of Entry within 7 days from Point of Shipment, particular pains being taken to send Consular Invoices under cover by first mail train to Customs Collector at which ever Port of Entry the car happens to travel.

An export entry blank is also made out by Station Agent for each car to accompany it to Port of Entry.

When the Station Agent receives shipping receipts from shippers, he signs two, the original and duplicate and returns to shipper—the shipping order he keeps and then refers to his classification and inserts rates furnished him by the Traffic Department.

ORDERING CARS.

In calling for cars to load we must first place our order through the station agent, who in turn calls on his Chief Despatcher, and on up to the Superintendent of Car Service. If racks are required we must notify him also of the importance of loading such cars for home station only, for they are our equipment, and are our best assets in time of car famine. Failure to do this on the part of the Agent must be immediately reported by wire to Traffic Department at home office. A daily report of cars ordered, received and loaded should also be sent to home office on Postal Cards furnished for such purpose.

WORK OF TRAFFIC MANAGER.

It is now a recognized fact amongst large industrial concerns in the United States and Canada that a traffic department for the handling of inward and outward bound freight and freight rates is becoming most indispensable.

The rate of freight must first be considered. Under the Law the Shipper himself is responsible for the freight rate he uses, and must know of his own knowledge what the legal rates are. No dependance can be placed upon Railroad Agents or Representatives for quotations.

The use by a Sales Manager of a rate quoted him through such sources that may be less than the published tariff rate, may secure the contract for the Sales Manager, but would in the end involve him in a loss over and above his profits of hundreds of dollars, because the Railroads cannot protect their quotations,—and the Shipper must pay the legal higher rate, and stand the loss, unless he brings civil suit for actual damages. On complaint to the Interstate Commerce Commission at Washington the offending Railroad is fined \$250.00, the fine going into the United States Treasury.

The Railroad tariffs are not so constructed that everyone can read and comprehend. It is as difficult for an ordinary business man to pick up a tariff and the right one at that, and find the right rate, as it is for an ordinary business man with no knowledge of the law to find in the law books the right solution on any particular subject.

The Sales Manager of any Concern which manufactures or buys or sells and ships freight to all sections of our own and to foreign Countries must know the freight rates before he can quote prices.

The Purchasing Agent must know the freight rates from various points of origin to various destinations in order that he may figure the cost at delivering point, and know where to buy.

The Accounting Department must be informed whether the freight allowance on invoices for materials purchased are correct.

The Invoicing Department must know the rates of freight—if freight is allowed or equalized.

All this information should be ready at hand and furnished promptly.

The Manager of the Traffic Department must be competent to handle the largest questions, which are constantly arising in connection with Transportation effecting the interest of his Employers.

He must be familiar with Railroad methods, keep informed of contemplated changes in rates, changes in Rules and Regulations, and in the classification of his own commodities, and to move the inward bound freight in such a way as to escape demurrage.

CO-OPERATION.

And now in conclusion I would ask my hearers for their hearty co-operation in bringing the Traffic Department up to a high state of efficiency. By the fruit of our labor we shall be known, and thus create abroad our loyalty to our Employers. I have in mind a parable of a member of a railroad traffic department walking along the railroad track, and discovering a broken rail—he stopped and said “That is no concern of mine. It is the business of the section men.” Along came a train and was ditched with a large loss of property, simply because that traffic man did not warn the on-coming train, and was thus false to the interest of his company.

HORSE MANAGEMENT.

BY ED. GIBBONS.

DESIRABLE TYPES.

The Western horses which are mostly secured for woods operations are crosses between the Norman, Clydesdale, Shires and Percheron. To describe the exact type of horse best adapted for woods work would be a difficult matter, but there are a few of the more prominent characteristics which should be expected in horses for this work. He should have high withers, broad loins and chest; short back above; and be in general what is commonly known as a thick, chunky made horse; and above all should have perfect legs, as anything which seriously affects the legs makes the horse practically worthless for a worker. The upper arm should be long and muscular; the knee broad, flat and bony; shank short, flat and with firm sinews; the pastern joint moderately long, but not too much so, as excess produces springyness; the hoofs firm and erect; and the foot large and round. It is best to purchase horses for this purpose from 5 to 7 years of age, and they are seldom of any value for woods operations after they are 15 years old.

RECORDING.

As soon as horses are purchased for the Berlin Mills Company they are weighed and a number burned into the hoof. After this a card record is made giving number; purchase price; weight; color; age; and any special distinguishing marks. By means of this card a complete record is kept of the horse until he is sold or dies. In connection with the hoof branding, which is done twice a year on alternate fore feet, it will be well to note that this must be performed carefully in order not to burn through the outside shell. If it is improperly done it is liable to cause a crack in the foot which will take a long time to grow out and may cause the horse to go lame.

WORKING CAPACITY.

To determine the number of horses required for any specific operation it is necessary to have a general idea of the distance to be covered daily. This will, of course, vary with the ability of the horse, the weight of load to be hauled, and condition of the road to be traveled. Some horses can travel with a moderate load over average roads 25 miles a day for several days in succession, but for horses working day in and day out in the woods 18 miles per day is considered a good average.

IDLENESS.

The number of horses which the Berlin Mills and its subsidiary companies own (300 or more) varies greatly from time to time according to the amount of logging which they are doing themselves and the amount which they let out to jobbers. The investment and maintenance expense repre-

sented thereby requires careful supervision, as to the kind and fitness of the horses purchased; the care which is taken of them, and as to keeping them at work to the best advantage. With most classes of property idleness represents principally loss in interest on the investment, but when a horse is idle the maintenance charge is constantly going on and the interest on the investment is a very small item as compared therewith.

SHOEING.

Before a horse is put to work it is very important to see that he is properly shod. The shoe should be put on so that the frog is as near the ground as possible, for if a horse is kept on caulks so that the frog does not strike the ground the heels will turn in and the quarters drop down and may cause him to go lame. A bar shoe is the proper shoe for horses to wear on a hard road, as there is a frog pressure and the quarters will be kept in place. Caulks should never be put on the shoes of a driving horse, except when the roads are frozen so that it is necessary to have them sharpened.

HARNESSES.

After being properly shod he should be provided with a well fitting harness. Special attention should be given to the collar, for if it is too loose it will gall the shoulders and chafe the neck, and if too tight it will interfere with his breathing by pressure on the wind pipe. All collars should be carefully fitted to the horse on which they are to be used. It is also important to see that the breeching is not dropped too low, for in going down hill if the load pushes hard a low breeching will draw the hind legs together, causing the horse to interfere, and if the ankles become sore from interfering he is liable to keep on hitting them. On driving harnesses it is important to see that the back strap is of the proper length, as there is a place on the back of every horse where the saddle should set, and if it is above or below this point, owing to the strap being too long or too short, it will almost always cause a sore back.

VENTILATION OF STABLES.

It is very important that horses be well stabled if they are to be kept in good working condition. The conditions in town stables are as a rule fairly satisfactory in this regard, but in woods hovels we seldom find sufficient ventilation or enough room allowed. These hovels should be ventilated on each end and in the middle, being careful to have same sufficiently high up so that it will not blow directly onto the horses. Horses coming into a poorly ventilated hovel after a day's work all steaming and with snow on them will wet the sides and roof which forms into frost, and when they come in the next night this frost melts and drops down onto them, so that they might as well be in a rain storm. Also if a sick horse has to stay in such hovels the temperature may change as much as 40 degrees in half an hour after the other horses go out, and these sudden changes often give them chills and leads to pneumonia.

STALLS.

There should be a ten foot wall behind the horses, and each horse should be allowed a separate stall from 4½ to 5 feet wide. In a great many cases double stalls are used. These, however, should never be al-

lowed, as when horses are feeding they are liable to kick the horse next to them. The stalls should be 9 feet long, although at present they are seldom over 7 feet in the woods hovels, which is not sufficient to protect the horses from being kicked. In hovels which are some distance back in the woods bedding is very little used, but horses would do better with less feed and good bedding.

FEEDING.

Proper feeding has a great deal to do with a horse's fitness for work. A horse should be allowed to stand from three-quarters to an hour after coming in before being grained, and should never be watered directly after coming in when he is liable to be warm, as he may drink too much and bring on colic or founder. He should, however, be watered sparingly before being fed. Horses doing hard work in the woods require from 12 to 15 quarts of oats a day. There are some horses who will not eat clear oats and it is necessary to mix a little corn in with them, but not over a pint should be put in at a feed, as, although they may not keep quite as fat, their muscle will be harder and there will be less sickness if as little corn as possible is used. For driving horses from 9 to 10 quarts of oats per day are required, depending upon the horse.

DISEASES.

The diseases of horses are many, but there are a few of the more common which require immediate treatment and the symptoms and first aid of which should be commonly known. They are: Colic, Inflammation of the Bowels, Congestion of the Lungs, leading to Pneumonia and Black Water.

COLIC.

As Colic and Inflammation of the Bowels are sometimes confused in their early stages, and as the treatment of the two should be very different, it is well to have a clear understanding of the differences in the symptoms of each.

Colic starts in suddenly and without any warning. The pulse is rarely much quicker in the first stages and during the intervals of ease. The legs and ears retain their natural temperature, and there are intervals of rest and ease, and the strength is scarcely affected.

With Inflammation of the Bowels the attack is gradual in its approach with previous indications of fever. The pulse is very much quicker, but small, and often scarcely to be felt. The legs and ears are cold, the belly exceedingly painful and tender to the touch, and pain is evidently increased by motion. There is constant pain and great weakness, with cold sweats, and the horse will constantly keep walking.

For immediate treatment of Colic if there is nothing else at hand it is best to use cayenne pepper and salaratus mixing about two ounces of salaratus and one ounce of cayenne pepper in one-half pint of warm water, to be given every hour. If the Colic continues a quart of linseed oil should be given, being careful to see that no water or food is given to the horse at this time. If this treatment does not complete a cure in ten hours a hot bran mash should be given, but no hearty food should be allowed until after the horse stops scouring nor any cold water.

For quick treatment of Inflammation of the Bowels the only thing one can do where a Veterinary is not at hand is to use hot blankets, which should

be used as follows: Put two blankets in a tub of hot water, then wring them out as dry as possible, using a wringing machine for this purpose if one is at hand. Put one over the horse's back and one under the belly, holding them tight together and pinning them with safety pins. Then throw a blanket on the outside and rub as often as possible. This treatment, however, is not advisable in hovels where there is liable to be much change in temperature, as the horse is liable to have a chill which will be sure to cause his death.

INFLAMMATION OF LUNGS.

Inflammation of the Lungs is a disease which although almost unknown to the horse in his wild state, is one to which he is most liable after domestication, and it requires immediate and active treatment. It is generally preceded by fever, but is sometimes sudden in its attack. The pulse is not always quickened at first, but is indistinct. The extremities are cold; the lining membrane of the nostrils becomes intensely red; the breathing is quick, hard and seems to be interrupted by pain. The horse stands stiffly with his legs far apart, so as to distend his chest to the utmost, and is unwilling to move or lie down.

For treatment of Inflammation of the Lungs the hair should be clipped off behind the forward legs on the first four ribs well down under the body and a mustard paste put on, using cold water in mixing the mustard. Rub the mustard well into the skin, draw a newspaper closely over it and blanket the horse, drawing a sureingle tight over the poultice. He will be distressed for the first hour, breath heavily and will thrash around considerably. In six hours wash the mustard off with hot water and grease the lungs with lard or any other grease at hand. Quinine and Fever Drops should also be used. One-half ounce of Quinine which has been cut with alcohol or spirits of nitre and mixed in one-half pint of cold water to be given twice a day. One dram of fever drops as used by the Berlin Mills Company should be given on the tongue every hour. If it is found that water is forming on the lungs, which can be noticed by swelling between the forward legs, then the only thing to do is to call a Veterinary, as a horse seldom recovers after this sets in.

BLACK WATER.

Black Water is brought on by allowing a horse to stand in the stable too long without exercise and feeding him too much grain. We are especially troubled with it in the woods where horses are sometimes kept in the hovels for several days owing to weather conditions, and when they are brought out they may go for a mile or so and then their hips will become paralyzed and they will fall down. At this stage the only thing to do is to draw off their water which should be done by a Veterinary. If, however, teamsters and feeders would cut down the amount of grain fed when a horse has to stand in to one quart at a feed and give them five minutes exercise a day they would never be troubled with Black Water.

CAULKING.

In connection with our woods horses we have in the past had a great deal of trouble through horses caulking themselves on the band of the coronet, as teamsters and foremen have not considered these wounds as at all serious,

and numbers of horses so wounded have died through blood poisoning setting in. Teamsters are now however beginning to realize the seriousness of such wounds and taking greater care of them, and not having their horses shod with sharp caulks on the inside. If a horse is so wounded the remedy is very simple and if carried out no serious results will follow. His foot should be put in a pail of hot water in which some good antiseptic has been placed and soaked for an hour, after which a hot flaxseed poultice should be fastened over the wound. With this treatment in one or two days the horse will be all right and no bad effects will follow.

CALLING A VETERINARY.

A Veterinary should always be called when a horse becomes sick and those in attendance cannot tell what is the trouble with him, as they may give him medicine which will do him more harm than good, and should also be called in case of pneumonia, black water, typhoid fever, and in such other diseases as are not easily handled by the ordinary horseman.

KIND TREATMENT.

We sometimes get horses, which, although they are sound and physically able to do all the work required of them, have such faults as a stubborn and ugly disposition or are balkers. Such horses should always be handled very carefully and kindly, and with proper treatment of this kind far better results are obtained than where harsh methods are employed, and a horse can often be worked out of such a fault. In this connection we might say that it has always been a rigid rule of the Berlin Mills Company not to allow any men working for them to abuse a horse in any way.

CARE OF LEGS.

As the proper condition of the legs of a horse are so essential to his efficiency as a worker it will be well to note some points in connection with their care. The legs should never be brushed when they are wet as the dirt is liable to be rubbed into the skin. When the legs become thoroughly dry they should be rubbed down with a brush or straw but never rubbed up as this would also work the dirt into the skin. A horse's legs should never be washed in warm water to remove mud as the hot water will crack them and bring on scratches, mud fever, or greased heels. The hair should never be clipped off of a horse's legs in the winter time or in the spring when it is muddy and the winds are cold as the skin will crack; the hair being a protection to the skin.

WATERING.

When driving horses on the road they should be given water every three hours if possible and if they are very warm they should not be allowed to drink over half a bucket-full at a time.

LIFE OF HORSES.

Practically all of the horses which we use are purchased in the West, and the average life of such horses in our business is from ten to twelve years.

TIME TO BUY.

These horses are purchased in the fall at which time they can be bought from ten to fifteen dollars per head cheaper than in the spring, as the raisers do not want to carry them through the winter.

SHIPPING.

In buying horses in car-load lots from the West the best way to ship them is by express. In shipping horses by freight there is great risk of damage to them by bruising through rough handling of freight trains and also a good deal of expense in unloading them every 22 hours as required by law. When horses are shipped by express the law allows 36 hours for them to remain in the car, so that they can be shipped from Chicago to Portland or Berlin without unloading.

TIME TO SELL.

When the Woods operations are finished in the spring we cull out such horses as we wish to dispose of and these are usually shipped to Portland and sold at private sale, which method we find is more satisfactory and yields better results than by auction.

PASTURE.

After culling out these horses the remainder are put out to pasture which can usually be done from the 12th to the 18th of May. While in the pasture we have their front feet shod, as in our rocky pastures if a horse is not shod he will wear off his feet almost to the quick and when taken up in the fall their feet will be very small and there will not be shell enough to hold the shoes on properly. We visit our horses in the pasture twice a week, to see if they are all right and they are counted at each visit.

BARK AND ITS USES.

BY J. A. TAYLOR.

Hemlock Bark.

Hemlock bark is used for tanning purposes. It has as we know a very rough exterior, and contains from 8 to 10 per cent. of tanning, while the extract, the form in which it is exported, contains from 20 to 30 per cent. of tanning. Measured by value, bark now represents 40 per cent. of the vegetable tanning used in the country, but there are few tanneries dependent upon it, as the liquid extract has displaced it almost entirely.

The Extract, as supplied in the market, is a concentrated preparation that saves freight. The bark is ground and placed in wooden vats, where it is steeped in the water until the tanning acids are removed. The resulting liquor is then evaporated in a vacuum apparatus at 180 degrees Fahrenheit, until it is reduced to a heavy dark colored fluid weighing 10 pounds to the gallon.

The Extract is shipped in barrels of 500 pounds each.

The plant for making the Extract is expensive, and in the case of small growers a share in a cooperative plant is the solution of the problem.

PEELING.

In peeling Hemlock Bark, in order to make it valuable, great care should be taken to remove the bark in such a manner that it can be dried in pieces as large as possible.

The peeling extends from May to August; but the tree peels easiest from June to the middle of July. The peeling crew consists of three men; a chopper, preparer and barker. The chopper, or feller, cuts down the trees. The preparer or fitter, trims off the branches and rings the bark at intervals of four feet and slits each section lengthwise, while the spudder, or barker, peels off the bark with a flattened bar, and spreads it on the ground with the inner side up.

PILING.

After the bark has dried in the sun from five to ten days, it is piled exterior side uppermost to complete the seasoning process, which altogether occupies from two to three months.

Bark that has not been carefully dried, is called "roll bark," and is less valuable.

SAVING IN FREIGHT.

Hemlock produces on an average, one third of a cord of bark for every cord of wood peeled. A saving in freight is effected by its removal. A cord of green rough Hemlock wood weighs 6000 pounds, and a cord of dry rough Hemlock wood weighs 4000 pounds, while a cord of peeled dry Hemlock wood weighs from 3400 to 3800.

Spruce and Fir Bark.

The bark of the Balsam Fir and Spruce, is a smooth soft bark, very easily peeled during the peeling season in the woods, and has no value.

Spruce and Fir produce on an average, one-eighth of a cord of bark for every cord of wood. The process of peeling green Spruce and Fir, and allowing it to dry, diminishes the weight of the wood 30 to 40 per cent.

SAVING IN FREIGHT.

The amount of moisture in a cord of spruce and fir will vary, but ordinarily carries from 30 to 50 per cent. and a cord of peeled wood will vary correspondingly in weight from about 3300 to 4400 pounds. The difference due to moisture may add to the freight as much as 25 per cent. per cord to the cost at the mill.

A great deal depends, as to the weight of the wood, on the country in which it has been peeled; whether it be on a high sunny slope, or a low shaded swampy country.

INSECTS IN BARK.

The bark of the Fir and Spruce being soft, makes it very susceptible to insects, and these two species of trees are the most common field for these pests. One seldom sees a dead hemlock that has been killed by the bark boring beetle. This is due to the fact that it contains such a large amount of acid.

We find that these bark boring beetles, are the most destructive insects of the North American Forests; but they are at the same time among the easiest to control. One should give prompt attention to a destructive outbreak, as indicated by an abnormal percentage of yellow or red topped trees, and especially when such trees occur in groups of ten or more. In the event of an invasion of these pests, it is well to utilize the infested timber during the period in which the broods of the destructive beetles are in the immature stages, or fell the infested trees and remove the bark from the trunk, and burn the bark if necessary. If the broods develop to adults in the outer bark it must be burned, if they develop in the inner, burning is not necessary, or immerse the unbarked logs in water where the bark will remain long enough to kill the insects.

HAND PEELING.

There is no method by which bark can be removed with the same low cost and efficiency as is obtained by hand peeling or spudding so-called during the peeling season, May to August, in the woods: but the big paper mills find it difficult to obtain a sufficient supply of peeled wood, and therefore resort to other means of peeling rough wood at the mill.

The most common of these, is the hand Barker or Rosser. A disc, which has three knives, revolves, and the wood is held against the knives in such a way as to remove the bark. This method of peeling has been found expensive and wasteful as from 10 to 27 per cent of good wood is removed together with the bark.

REVOLVING DRUMS.

These drums are barreled shaped and revolve horizontally on hollow axes in their ends through which a stream of water continually flows. They have a capacity of 3 cords, and revolve 10 revolutions a minute, are filled through a trap door in their sides from a bin of 2 foot wood above and discharge through tripping this door into a V shaped trough below, but in order to get good results the drums should be filled to a little over half of their capacity; the reason for this is that the wood has more space to fall and gives the water, which circulates through, a better chance to wash out the bark as it becomes separated from the wood.

It has been found that these drums are not practical for peeling green, rough wood for the Sulphite Mills, as it takes about 3 hours to peel $1\frac{1}{2}$ cords of wood, and even after running them 3 hours a considerable amount of bark is left on the wood, especially the inner bark which is very hard to detect.

These drums, when wood can be left in the water from the time of the drive in the spring, until July or August, or some method of cooking used to soften the bark, are in my estimation, the best barkers that have been produced, as there is no loss of wood, and the expense of operating, about 25 per cent. of the cost of the hand rossing process. There is one objection to this method of barking wood, and that is due to the fact that wood tumbling inside of the Drums gets bruised on the ends, and collects more or less small particles of bark which is very injurious to the paper, especially during the winter season.

Log Rossers have been experimented with extensively, but are only useful on short regular sticks.

Spruce bark averages 12 per cent. of volume of the tree.

Fir bark averages 11 per cent. of the volume of the tree.

Hemlock bark averages 30 per cent. of the volume of the tree saw log size.

Poplar bark averages 14 per cent. of the volume of the tree.

MECHANICAL ACCESSORIES TO LOGGING AND DRIVING.

BY A. E. ROWELL.

THE LOGGING RAILROAD.

It is first necessary to make a preliminary survey of the course to be taken in order to lay the road out along the easiest grades and with the flattest curves possible. This work necessitates putting in the field a surveying crew composed of one transit and level man, one rodman, two axe men and a cook, the wages and expenses of which would be about \$25 a day, and under ordinary conditions they should be able to locate and stake out about one mile per week. The method which is used in staking out a railroad, is as follows: A line of center stakes are placed every one hundred feet on which cuts, fills and elevations are marked, also stakes at curves marked Point Curve and Point Tangent, and two other lines of stakes placed one on each side of the center stakes, giving the width of the right-of-way, which on a logging road is usually about forty feet, although permanent roads are from 120 to 300 feet wide.

After cutting the right-of-way as indicated by the outside lines of stakes, the next work to be done is the excavating, filling, laying of the track and grading. There is a wide range to the cost of doing this work, based on the nature of the country where it is to be performed and its accessibility, but we have found that it has cost from \$2500 to \$8000 per mile.

To the cost of the preliminary and construction work above will have to be added the following costs for material to be used before the road is ready for the rolling stock: Ties about \$1000 per mile; rails \$2600 for 65 pound; spikes \$100; joint straps \$200; making the estimated costs per mile as follows:

Surveying	\$ 150.00
Excavating, filling, laying track and grading	2,500.00 to \$8,000.00
Material	3,900.00

Or a total of\$6,550.00 to \$12,050.00
per mile for the complete construction of such a logging railroad, ready for the rolling stock, which should cost about as follows:

Locomotive	\$8,000.00
Necessary log bunks for two trips on a logging rail- road of say approximately 10 miles where the grades are 4 per cent. or less, which would re- quire 15 sets	5,250.00
1 wing plow, and one flange plow	2,500.00
Engine House	300.00
Storehouse	600.00
Hand car	50.00
Track tools, repair parts, etc.	1,000.00

Or a total for equipment of\$17,700.00

To operate such a road will require a train crew of 5 men and a track crew of 3 men, about 400 gallons of oil per day for the locomotive making two round trips, at a total daily expense of about \$60.

If coal is used in place of oil the cost of operating per day would be from \$5.00 to \$10.00 less than where oil is used, depending upon the market variations in price between the two fuels; and if wood is used the cost would be from \$5.00 to \$8.00 per day greater than with oil.

The above equipment should be able on an average haul of 6 miles and on an average grade of 3 per cent to make two round trips per day of 12 loads each, or 24 bunks, each load having 3500 ft. of soft wood, or a total of 42,000 ft. per train load, or 84,000 ft. per day's run. On this basis the cost of hauling would be between 4 and 5 cents per ton mile hauled.

On a logging railroad equipped with special engine curves up to 40 degrees are practical, although it makes the operation of the road much easier and more economical if the curves are kept down as flat as possible.

Logging railroads are sometimes constructed with narrow gauge tracks, but it has been found that the standard gauge track is the most successful, as the increased width gives the cars much greater stability and increases the amount of timber which can be carried on them. The fact also that the rolling stock is interchangeable with the regular public railroads makes it possible to dispose of it to better advantage.

DRIVING BOATS.

In connection with the driving of logs tow boats are the principal mechanical accessory used in the lakes. Of these there are two general classes, namely, side wheelers and screw propellers. It is found that side wheelers are the most practical kind to use for this purpose, owing to the fact that it is necessary to build such a boat as shallow as possible in order that it may be run in close to the banks, where a screw propeller would be in danger of breaking.

These boats may be fitted up for handling logs in two ways, that is, direct towing, and towing by means of winding drums while the boat is anchored. We have in use in the lakes two direct towing boats and two with winding drums and large anchors. The winding drum boats have great advantage over the direct towing boats in that they can be successfully used in head winds. These boats are equipped with a 1500 to 2000 pound anchor, a 1 inch wire cable attached to the anchor, and a 1½ inch rope 1600 to 2000 ft. in length, which is hitched to the boom, and with one winding the boom can be pulled up from 1500 to 1900 feet. These boats will handle booms containing anywhere from one to four million feet of logs, but it is found most practical to handle about 1½ million feet. For one million feet of logs approximately 57 boom sticks 30 feet long are required together with chains; for two million 81; for 3 million 98; and for four million 114. These figures will vary according to the size of the timber contained in the boom. One million feet of timber will cover from 5½ to 11½ acres of water. It is found advisable where 4 foot wood is to be towed in a boom to mix in some 8 foot or longer logs, as these will cause the short wood to jam up and prevent them from jumping the boom. Where four foot wood alone is to be held in a boom it can be safely done if a four stick boom is used.

One of the steamers has been fitted up with a special lighting plant having a 13 inch high powered search light, which makes it possible to tow, hitch and land logs as well at night as in the day.

The cost of towing by the use of winding drum boats is less than with direct towing boats owing to the fact that the tow boat has to be much higher powered in proportion to the logs towed, and therefor uses about one third more fuel, and also loses much time when the wind is blowing too strong for its successful operation.

HEAD WORKS.

Previous to the use of tow boats this work was done by means of headworks, which are still in use to quite an extent. These headworks are constructed by building a raft of logs 16 to 18 feet wide and 30 to 40 feet long, which are held together by cross ties roped and pinned with $1\frac{1}{2}$ inch pins. In the middle of the center log, which is the largest of the raft, a mortise is cut $4\frac{1}{2}$ to 5 inches wide by 14 inches long and about 10 inches deep. Into this mortise is fitted a hardwood spindle about 5 to 6 feet high, 6 inches in diameter at the bottom and 5 inches at the top with a key wedge, and on this spindle is fitted a capstan head, which varies in size from 16 to 20 inches in diameter, and is about 5 feet long. At the bottom of this capstan head there are inserted about 12 pins $1\frac{1}{2}$ long in order to keep the rope from falling off of the head. Eight inches from the top of the head 12 holes are cut $2\frac{1}{2}$ to 4 inches to receive 12 levers 6 feet long. On the other end of the raft an anchor is placed weighing from 105 to 200 pounds, and on this anchor is made fast a coil of $1\frac{1}{4}$ inch rope. This anchor is taken in the stern of a bateau with a boat's crew of 6 men and another boat and crew ahead to help in pulling it out. The anchor is rowed out the length of the line, which is generally 1200 feet, where it is dropped, and the crews return to the raft to wind up to the anchor; this operation being repeated until the logs reach their destination.

It should be specially noted in regard to capstan heads and spindles that they should invariably be made of a standard size, so that they will fit wherever sent, as it has often been the cause of much delay and expense where sizes have been made which are not interchangeable.

LOG SLICES.

An interesting construction in connection with driving operations is the conveyance of logs long distances through the woods by means of a log sluice. This sluice is V shaped and about 4 feet deep, being about 1 foot wide on the bottom and 5 feet on top, and built of 3 inch matched spruce plank. One million feet of logs can be put through a mile sluice of this kind easily in a day.

A log sluice below or above the gates of a dam is also of much service in conserving storage water, operating on a hinge or rollers to raise or lower according to the height of the water. From one to two million feet a day can be turned through such a sluice according to size.

PURCHASING.

BY W. H. HOFFSES.

It is best to have all purchases made in as regular and systematic a way as is consistent under the conditions governing the purchase. Healthy competition should be brought into play at all times when practical; none to be favored with orders for personal friendship's sake; and all prospective sellers to be treated in an open, courteous, straight-forward and frank manner.

With the buyer supplied with proper data and information as regards the quantity and quality of the article wanted and probable date same is required, it is an easy matter to make the purchase for any company which has financial strength and general business reputation.

METHODS OF BUYING.

Methods in buying is where buyers differ. Many think that if anything is wanted the greater number of prospective sellers so being advised, the lower they will be able to secure their requirements and on this basis they conduct their purchasing.

Generally we believe it best to select a few of the most reliable dealers in the line of goods wanted and after the matter has been put to each, place order with the one giving us the most satisfactory proposition.

When the quantity wanted is considerable as compared with the available supply the least said concerning a prospective purchase the better. You can readily see that with conditions of this sort, unless carefully handled, the market price would be perceptibly disturbed to the disadvantage of the buyer.

Buy of reputable people. Place orders not with the idea that you are doing it to please or favor a friend, or that you are entitled to any thanks for so doing, but with the idea that you have performed an act principally for the benefit of your concern, trusting of course the business is of such value to the seller that he or they will promptly make delivery of the goods as arranged.

Efficiency in buying is contingent on the degree of co-operation between individuals and departments interested in the buying problem of the company represented.

STOREHOUSES.

A few things to be considered in connection with buying and maintaining well balanced stocks in the storehouses and supply depots are:

First—A well informed and responsible man in charge of Storehouses.

Second—Co-operation between such a man and the purchasing agent.

Third—Inventories reported systematically and frequently.

Fourth—Purchase records of such a character and form as would be of value for future reference within a reasonable cost for expense of maintaining same.

CO OPERATION.

This word is much used, but not always fully understood or correctly interpreted. It means efficiency and consideration of the best good for the concern rather than personal feeling. We should all co-operate to the best of our understanding. There are no conditions that justify any disregard of it. It not only applies to buying, but as I have said before, applies to every move made by any and all employees in every department and under all conditions.

INVENTORIES.

The value of the supplies accumulated in the storehouses and supply depots usually aggregate a large sum of money. Even with great care and close attention by the persons in charge of storehouses there are bound to be losses and shrinkages.

It is generally calculated to be good policy to buy short rather than long so as to be able to clean up at certain periods, if possible.

The arguments in connection with small inventories are all one way. The saving in interest on the investment, the loss by deterioration, the chances of loss or damage by fire or burglary or water, damage by rats, etc., many times offset any possible gain that could be chanced by buying on a low market and carrying a heavy stock over from one season to another with the idea in view that the subsequent season would find higher prices prevailing.

RECORDS OF PURCHASES.

Purchase records can be kept in a condensed form at comparatively little expense and trouble, or they can be kept in an extended and more complete form which means extra expense and care. Generally speaking it is of small value to carry extended and complete purchase records of a purchase. After the bill has been checked on the purchase order and left the purchasing department the purchase is practically dead. Each purchase is a proposition by itself. In many instances a purchase today is a duplicate of yesterday if price has not changed in the meantime.

Systematic and complete records of purchases are helpful to a beginner in buying. After a few years it is of little value. There is a limit to the expense which should be put into such matters.

FUNDS AND BANKING.

BY L. G. GURNETT.

ESTIMATES.

To the financial department comes the duty of providing for paying out the money, which is needed in the business. This department needs to be prepared with a fairly accurate estimate of the cash requirements and when they are needed. It is not my intention to speak of the constantly varying conditions of the money market, nor the factors which enter into the cost of money or its constantly changing supply, but merely to impress upon you the importance of anticipating cash needs. The estimate which comes to the financial department is made upon a basis of the amount of wood needed in our business at the market price. This wood comes from many different points, and numerous operations, of which you are in charge. The cash requirements of one operation may be very different from another, though the amount of wood produced is the same. It is necessary, therefore, for the head office of the woods department to gather together the different estimates from each operation and summarize them, the result coming to the financial department, whose duty it is to plan and arrange for the funds needed in order that obligations can be promptly met. To have the final estimate fairly accurate, after you have learned the amount of wood you are to secure during a certain period, you should plan the work of your department so that it is distributed over the period to the best advantage for economical handling, and then estimate the amount in cash needed monthly.

The advantage to the financial department of complete fairly accurate and prompt estimates is very great and of valuable assistance to the company in the handling of its manifold affairs.

BANK ACCOUNTS.

Many of you, as agents of the company, are managing bank accounts, and while you are all familiar with the ordinary process of drawing a check, and aware of the necessity of never overdrawing your account, perhaps there is a doubt in your minds concerning the amount you should carry as a balance. This amount of balance is an important one, and is dependent upon the character of the account, and its activity. In banking circles, accounts are known as "borrowing" and "checking" accounts. A borrowing account means that in addition to all the privileges of a checking account, the depositor is entitled to borrow money in proportion to his credit, and a certain amount of balance to be kept in the account. As you are not carrying borrowing accounts, you are more interested in the "checking" accounts, which means that you may make deposits, and draw out the money by checks, the bank performing the clerical work of keeping the account. Upon the activity of the account, which means the frequency of withdrawals and deposits of money, the average amount

of balance should be determined. The bank expects a balance in proportion to the labor it furnishes for your benefit. There is no fixed rule governing this point, but it is obvious to you that a bank handling an account involving one thousand entries yearly mostly withdrawals each requiring the careful scrutiny of the paying teller to guard against forgeries and raised amounts, expects a larger balance than an account requiring a less number of entries, and you should be willing to pay this extra cost. Judgment should be used, always keeping in mind that an average balance of \$100 brings the bank \$6 annually in interest, and of course for that you would not ask it to perform \$30 worth of labor but would carry an average of \$500, and some more, so that the bank by making a little profit would appreciate the account.

RAISING OF CHECKS

The subject of check raising and means of preventing same, may be of interest to you, although in ten years no forged or raised check has come to my notice. Of all the thousands of checks sent out by our companies, not one has ever been raised in amount. Of course, we take precautions to prevent, and the safeguard which has come to be recognized as the best is the perforating machine, simply a stamping machine which cuts the fiber of the paper by a series of small sharp knives into the words and letters needed, inking at the same time—so that the check bears an unchangeable legend reading—"Not over so many dollars."

Of the checks coming to us from customers not more than one in ten have any protection. Strange as it may seem, but few of this class of checks are raised, but only because they are received by honest people and cashed through their banks. A bank is responsible for loss through forged or raised checks, but is not liable should a check be drawn so carelessly that the raising of it became a simple and easy operation.

We have, however, had several experiences with the camp orders, as given by the Woods Department. These orders circulate as do bank notes, and we cash them upon presentation..

The prevention means must be taken at source, and I offer as a suggestion the method employed by the express companies in issuing money orders. There should be a limit to the amount a camp order is drawn for, say \$100 and at the side of the order should be printed figures from 5 to 100 inclosed in small squares or lines and all the figures above the amount the order is for are torn off—showing the even dollars—the cents are unimportant.

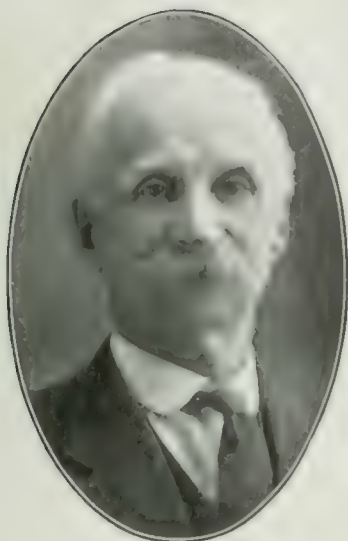
CASH CALLS

In calling for money for your operations, it would be well to state on your requisition when the money is needed, and it should be anticipated a few days. The office on which you call can then forward to the financial department vouchers giving the same information.

DISCOUNTS ON CHECKS.

I understand that many times banks in Canada charge a collection on checks. It prevails in the States between cities and places not exchanging at par. This collection charge is not always made against customers or depositors of banks who carry a good average deposit, but is absorbed by the bank in consideration of such deposit balance.

In Canada, the custom is almost universal, except between branches, and even then unless an agreement is made with a bank that checks drawn upon it will be cashed at any branch at par—in which event it is necessary to stamp each check with the words “Payable at par at any branch in such and such Province.” It often happens that you have bills to pay for labor and material in localities where there is no branch of the bank in which your deposit is kept, and parties receiving the check may object to paying collection charges upon same, in which event, and if the number of transactions warrant the trouble, a lump sum could be diverted from your main deposit to another bank, with branches in the section you are operating. You would need to pay a collection charge upon the exchange, and even if you called on the financial department for the amount of this special deposit, we would still pay a collection charge, unless we carried a deposit with the bank at whose branch you wanted the account, in which case, of course, it would give you credit at par.



Geo. E. King

1897 date

Henry H. Hindle

1898 date

Dan O'Brien

1897 date

A. E. Brown

1897 date

H. F. Carter

1898 date

INSURANCE.

BY H. S. GREGORY.

DEFINITION

Insurance is defined as "A contract of indemnity whereby one party, in consideration of a specific amount called the premium, undertakes to guarantee another against risk of loss." As commonly thought of it is divided into four general divisions, namely, Life, Fire, Accident and Liability. There are, however, numerous other branches, so that it is almost impossible to conceive of any loss which might occur in the course of human undertakings against which it would not be possible to secure previous protection by insurance.

Few people are aware of the great variety of risks which are accepted outside of those coming under the four general divisions. For example, we find persons insuring themselves against having to undergo an operation for appendicitis; young ladies insuring themselves against the disappointments of spinsterhood; husbands insured in the event of their spouses presenting them with twins; and it is reported that recently an undertaker applied for insurance that would relieve him of any liability for shocks caused to private individuals by his coffins being taken to the wrong house at night.

HISTORY OF FIRE INSURANCE.

The first public demand for fire insurance was made shortly after the fire of London in 1666. A number of plans were tried, but the first really successful companies formed were the Sun of London in 1710 and the Royal Exchange and London Assurance in 1720, all of which are still in existence.

Fire insurance was therefore in its infancy during the colonization period of this country, and the Englishmen who came over as settlers brought the idea with them. In 1752 at Philadelphia was established the first fire insurance company in America under the name of the Philadelphia Contributionship. To show the peculiar ideas which the early pioneers held in regard to insurance of this kind it might be mentioned that the Directors of the Contributionship decided that houses having trees planted before them should not be insured, because the trees made it difficult to fight fires. This policy, however, created considerable opposition, out of which grew in 1784 the Mutual Assurance Company, the house mark of which was a green tree cast in lead and which was fastened to a shield-shaped board and affixed to the front of the insured property.

From these early beginnings there has been a constant advance made in fire underwriting, so that while at first, through inexperience and lack of governmental supervision faulty methods were pursued and unsound rates established, the business has now been systematized and through legislation and experience placed on a sure footing. As an example of the rapid growth of

fire insurance business during the past years, we find that while in 1869 risks were taken in Canada to an amount of \$188,360,000, at a total premium of \$1,787,000, that in 1912 risks were taken to an amount of \$2,374,260,000, at a total premium of \$30,277,000.

CANADIAN INSURANCE LAWS.

It will be well to note some of the more essential points in regard to the Canadian Fire Insurance laws. For the supervision of insurance companies in Canada the Government has established a Department of Insurance, at the head of which is the Minister of Finance. Before any insurance company can solicit or transact business in Canada, they must first secure a license which will be issued by the Minister of Finance, and before such a license will be granted they must deposit with him satisfactory securities to an amount of \$50,000. While the Canadian Government does not in the strict sense of the word guarantee that all policies taken out with companies holding a Canadian license will be paid in case of loss, it does by means of the deposit required, and the general supervision and regulations for conducting the business as prescribed by law, practically protect the assured to this extent.

While no person or company has a right to solicit or insure property in Canada without first obtaining a license, any person may insure his property situated in Canada in a foreign unlicensed company, provided such insurance is effected outside of Canada and without any solicitation whatsoever, directly or indirectly, on the part of such company or its agents. Any person so insuring their property is required to make a return to the Superintendent of Insurance not later than March 1st following, giving location, description of property, amount of insurance, and name of company with which it is placed, and failing to do this is liable to a fine of \$10 per day during which default continues.

CANADIAN INSURANCE COMPANIES.

In placing fire insurance in Canada we find two classes of companies, namely, Tariff and Non-Tariff. The distinction between the two is that the Tariff companies belong to an Association known as the Canadian Fire Underwriters which establishes rates to be charged, and which are binding upon all the companies in the association, while Non-Tariff companies are not so associated and are free to fix rates at the discretion of their officers. The Tariff companies are considered as a class more reliable than the Non-Tariff companies, as the arbitrary rates established are figured at a safe margin by actual experience tables, while Non-Tariff companies may sometimes accept business at a rate which is not warranted by past experience.

We will first consider such Insurance as is placed on buildings, including taking-out plants, offices, houses and barns. We find that in placing such insurance that the regular standard form of policy does not always meet the requirements of every case, and it is necessary to add endorsements, which are sometimes termed riders, as, for instance, to make special provision in the case of a mill which is to be operated only a portion of the year; to provide for alterations to be made other than those which are specifically allowed by the printed form of the policy; to obtain permission for a house to be vacant for a greater length of time than stated in the regular form. Another endorsement which is

frequently placed on policies of this class is the Reduced Rate Average Clause, or, as it is commonly called, the Co-insurance Clause. This clause specifies that the assured is to maintain insurance to the extent of a certain per cent. of the actual cash value of the property insured, usually 80 or 100 per cent., and means that in case of partial loss if the assured has failed to place insurance to the full per cent. specified he is a co-insurer with the company, and must stand his proportion of the loss. For example, if A owns property valued at \$10,000, and by the terms of his policy is required to maintain insurance to an amount of 80 per cent. of its value, but only carries \$5000, he becomes a co-insurer with the company to the extent of \$3000, so that if a loss should occur amounting to say \$5000 he will have to bear $\frac{3}{8}$ of the loss and can collect from the company but $\frac{5}{8}$, or \$3125. We will see the reason for this clause if we take for example two properties owned by A and B, each valued at \$10,000. A insures his property for \$5,000 while B insures his for \$8,000, and losses of \$5,000 occur to both. Without any co-insurance clause the company would be liable to A for the full amount of his insurance of \$5000, while to B their liability for the loss of \$5000 would be but $62\frac{1}{2}$ per cent. of the amount of insurance carried by him, so that it is clear that A should pay more for his insurance than B, for in the case of a 50 per cent. loss the company would lose $12\frac{1}{2}$ per cent. more as proportioned to the premium than in the case of B. Therefore in order for A to obtain the same rate as B he should carry \$3,000 more insurance. If he does not wish to place this additional amount, then the co-insurance clause provides that for the amount which he does not carry he shall be a co-insurer with the company.

ENDORSEMENT OF AGENTS.

It should always be carefully noted that all clauses affixed to policies are properly endorsed by authorized agents of the insurance companies.

SETTLEMENT

Fire insurance companies as a general rule realize that in order for them to build up and maintain a successful and paying business they must at all times actually assume the full risks as represented by their policies. We find in this business, however, as in many others, companies who do not realize the great asset which a reputation for fair and square dealing will give them. Then again we find some agents who through misrepresentation and sharp practice put their companies in a questionable position. The policy governing the principal companies, however, is to accept insurance with a clear understanding with the assured as to the risk which they are assuming, and in case of loss to make prompt settlement, as past experience has shown them how harmful it is to the continued prosperity of their business to have disputes in regard to settlement of claims, especially if they are brought into court.

EMPLOYERS' LIABILITY INSURANCE

Employers' Liability Insurance, or as it is commonly called Liability Insurance is that form of insurance which: "Insures anyone against loss or damage resulting from accidents to or injury suffered by an employee or other person and for which the insured is liable." This is a very modern branch of the insurance business, and, as in the case of fire insurance, had its origin in

England, the first policy of this kind having been written in 1881, shortly after the passage of the first Employers' Liability Act, which was passed by the British Parliament in 1880. It was not long after this that Employers' Liability Acts were passed in several of our states, increasing the liability of the employer to his employees, so that it became necessary for them to seek protection through insurance against the increased risks, leading to the formation of Employers' Liability Insurance Companies.

In connection with this form of insurance in Canada we have first to consider the Canadian laws covering same, which are included in the Employers' Liability Act of 1909. Under this act, except in agricultural industries or navigation by means of sails, an employer is liable in case of accident or death to an employee as follows:

In case of absolute and permanent incapacity, to payment equal to fifty per cent. of his yearly wages.

In case of permanent and partial incapacity to payment equal to half the sum by which his wages have been reduced in consequence of the accident.

In case of temporary incapacity to compensation equal to one half the daily wages received at the time of the accident.

The above payments, however, not to exceed in any case \$2000.

When the accident causes death, payment to be made of a sum equal to four times the average yearly wages at the time of the accident, in no case to be less than one thousand dollars or more than two thousand dollars.

Premiums for Liability insurance are fixed at a certain per cent. on the total amount paid out for wages, with provision that the company is liable in a sum not exceeding \$2000 for any injury or death to any one person, and not exceeding \$10,000 for injuries to or death of more than one person injured or killed in any one accident, but the settlement of any loss does not diminish the policy in the least, and it continues with the same liability for subsequent accidents which may occur during the life of the policy.

Many of the larger industrial concerns have instituted Liability Insurance Departments under their own supervision, and in the case of permanently located and continuously operated mills, where the employer is in close touch with his employees, his influence through kindly treatment and fair dealing will prevent excessive claims for slight injuries and lead to a more satisfactory adjustment for both employer and employee than where settlement is effected by means of an insurance company which has no personal interest in the welfare of the workman. Where, however, mills such as pulpwood cutting-up and loading plants are operated only a few months during the year, and the class of employees is more or less cosmopolitan, it is questionable whether a company could afford to assume the risk of the liability insurance.

MEALS AND COOKING.

BY J. H. GRAFF.

Introduction.

This Manual is presented not as a rigid rule to be followed to the letter but as of assistance and help to the cooks, that they may be able to better manage the camp with success and use the supplies at hand to the best possible advantage. The recipes are built upon past experience of feeding hundreds of men with good results and satisfaction to the men themselves.

RECOMMENDATIONS.

FIRST: Always use the best brands in the market. The cheap material costs the same to tote, never gives satisfactory results, there being always more or less waste, and pound for pound it gives less actual food than that costing a few cents more. The reason that a brand is cheaper than the standard is that it is either inferior or adulterated.

SECOND: Employ the best cooks possible and pay well if they are actually good cooks. Remember that a cheap cook not only can waste ten times his own wages but that he, even more than the operator, is responsible for a satisfied crew, and thereby may cheapen the operation more than figures can show.

THIRD: Always have provisions supplied regularly and in the right proportion to the camps that the men may be given the proper variety essential to a satisfactory diet.

FIRELESS COOKER.

The fact that a whole crew or sections of a crew often have to take their lunch away from the camp makes it practicable to have furnished a fireless cooker similar to those now on the market but specially adapted to the conditions in a lumber camp, so that the food could be kept hot for the crew.

TABLE UTENSILS.

The tinware in common use at present belongs to the time of our grandfathers and there is now no excuse for its existence in lumber camps. From a humane and sanitary point of view I do not think any man would care to take the moral responsibility of insisting upon the use of tinware. The proper, and in the end just as cheap, utensils to be used are agate or enameled ware, which should be of the best quality on the market. Both soup and meat plates should be provided, separate vegetable dishes and meat platters, but standardized and uniform so that one will fit into the other in order to save expense in transportation.

Suggestions as to the Work to be Done by the Cooks and Cookees.

THE COOKS.

The cook is in immediate charge of the cooking camp and directly responsible for its management. He should be a well instructed cook and especially selected for his ability to fill the position.

He is responsible for the preparations of all meals and the care and preservation of rations, and should see that fresh vegetables are picked over when first received. Those decayed should be thrown away, others not in first class condition should be washed and dried before storing.

He should frequently check the dishes and utensils for which he is responsible; and at the end of each month a list of all broken or missing articles should be given to the clerk.

He should see that all utensils are thoroughly cleaned and put in their proper places when not in use, and that cook room and dining room are in a clean condition.

He should see that the garbage and slop cans are frequently emptied and not allowed to stand in the cook room or in the vicinity of the outside doors.

The bills of fare must give constant variety. Try to have something for each meal that has not been served for some time.

Try to make each dish just a little better than before and see that all food is most carefully seasoned.

Remember that season penetrates food best in the liquid or semi-liquid state and much more quickly when hot than when cold.

Remember that the prevention of waste and the proper use of left over food is the secret of success in the cookroom.

THE COOKEE.

He is under the orders of the cook and is held responsible for the cleanliness in the cook room and for the dishes and utensils used therein.

Each morning after breakfast he sweeps out the oven, cleans the range and boilers, washes all the tables and sweeps the floor and washes the floor at least once every week.

He will serve all meals under the direction of the cook, and will wait on the table at meal time.

He will cut the bread and cake and pile it neatly upon plates.

After each meal he gathers up such food as may be left on the platters and returns it to the cook room to be disposed of by the cook.

Slices of bread not consumed will be piled as closely as possible to prevent exposure of the crumbs to the air and consequent drying out. They will be placed in the bread box and served first at the next meal.

Crumbs of bread accumulated in the bread box will not be thrown away but will be saved and used by the cook.

He will brush off and wash the tables after each meal and wipe off the salt and pepper cellars, vinegar bottles, mustard pots and sugar bowls with a clean damp towel and will see that they are clean and properly filled.

He is responsible for the cleanliness of the dishes and will see that plenty of boiling hot water is provided for rinsing them before wiping.

He is responsible for the cleanliness of the cake and bread boxes, and will scrub and scald them once a week and dry well over the range.

CLOTHING AND PERSONAL CLEANLINESS

Each cook and cookee should be provided with three white coats and six white aprons, and remember that personal cleanliness is of the greatest importance.

II

Serving the Meal.

The food after being cooked must be arranged on clean platters, vegetable dishes, etc.

The table must be set with care and kept scrupulously clean. Order in the dining room and conduct at the table are influenced by the care with which arrangements are made for the reception of the men.

In preparing food for the table (for example, sliced meat, etc.) all parts that in all probability will not be consumed, should be retained in the cook room, and be served in some other form, or otherwise used in the cook room.

No matter how well a meal may be prepared, it must be properly served to give satisfaction and to prevent unnecessary waste.

The cook superintends the service and sees that all are served properly and without delay.

The cookees keep the vegetable dishes and meat plates filled, transfer them to other tables or have them returned to the cook room.

As the men finish at each table, it is cleared off, the food remaining returned to the cook room, and the dishes placed in the sink for washing.

After dinner the bill of fare is made out for supper, care being taken to use all food left over from breakfast and dinner. At the same time the bills of fare are prepared for breakfast and dinner for the following day.

III

General Principles of Handling Rations.

MEAT.

Remember that in handling meat in the cook room all bones must be retained until all the juices have been extracted for stock, of which there is a sufficient quantity to provide a good stock soup nearly every day in the week.

METHODS OF COOKING

The object to be attained will often decide the manner of cooking. For example in roasting meat we desire to retain juices within. Hence, the meat is placed in a very hot oven to seal the pores and prevent the escape of the juices, the oven being reduced to a lower temperature when the meat has been thoroughly browned.

If we desire to make beef stock, we first place the bones and fresh meat in cold water for some time and the juices of the bones and meat are readily extracted in this manner.

The process is hastened by addition of a little salt.

If a stew or pot pie is made, we wish to have part of the meat juices retained in the meat and a part in the surrounding liquid; hence, we place the meat in cold water, but bring to a boil as soon as possible in order to seal the pores after a certain amount of the juices has been extracted, and retain the remainder within the meat.

If we want the best quality of boiled beef, we desire to retain the juices within the meat, and the water is made to boil briskly before the meat is introduced. Upon contact with hot water the pores are sealed, and the temperature may be lowered and the cooking continued at a simmering temperature.

SOUPS

A good soup should be prepared almost daily and be served in a course by itself.

Seek constantly variety of flavor by the use of fresh vegetables, beans, peas, macaroni, ham, bacon, etc.

One gallon of good soup is generally sufficient for ten or twelve men.

BREAD.

Bread should be served in thin slices to prevent waste and be piled closely as cut, to prevent drying out. All left over portions should be dried in a slow oven and crushed in small particles for use in the place of cracker crumbs in croquet meat balls, etc.

Bread pudding should be served occasionally to use up any surplus that may otherwise be a total loss.

VEGETABLES.

Onions and tomatoes are most valuable as seasoning components, though they should be served as a vegetable about once a week. The remaining vegetables should consist of cabbage, turnips, beets and carrots.

DRIED FRUITS.

Good recipes are given in this manual for handling dried fruits and they should be served at least once a day. The acids present in fruit are desirable in a well regulated diet.

IV

Meat Cutting.

BEEF.

Upon receipt, the quarter should be cut as shown in Figure 1 and 2, no matter how it is to be used.

Remember that a dry cool atmosphere is best for its preservation.

The heavy black lines on the figures show the first cuts made upon receipt of quarter for any purpose whatever. Numbers refer to general value of each cut for camp use, considering both quarters together.

Figure 1. Cut from A to B just in front of joint, E to F just under aitch bone, and G to H, using knife only.

Figure 2. Cut in order, A, B, C, D, E, etc. Cut from A to B to remove the shoulder, using the knife only.

HIND QUARTER OF BEEF

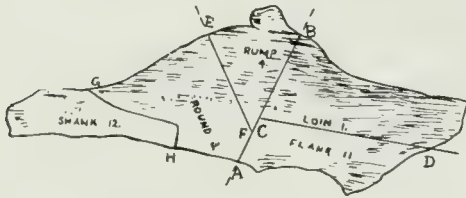


FIG. 1.

FORE QUARTER OF BEEF

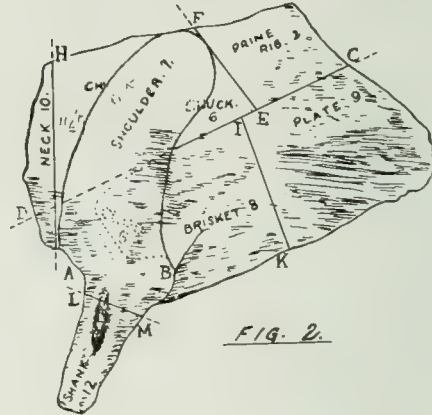


FIG. 2.

CARCASS OF PORK SHOWING CUTS

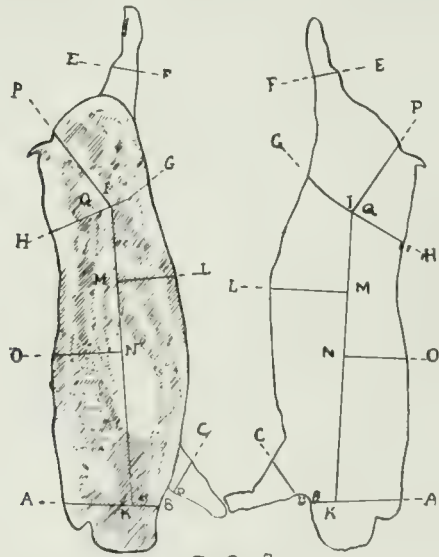


FIG. 3.

Section of Parts for Different Uses in the Kitchen.

The parts of the carcass should be selected in the following order, when quality alone is considered.

ORDER	ROASTS	STEAKS	BOILED BEEF	CORNEDBEEF
1	Prime Rib	Loin	Shoulder	Brisket
2	Loin	Round	Brisket	Plate
3	Round	Prime Rib	Plate	Flank
4	Rump	Rump	Flank	Rump
5	Chuck	Clod	Shank	Shoulder
6	Shoulder	Chuck	Neck	
7	Brisket	Shoulder		
	(only as a last resort)			

For Stews—all parts of the carcass; but for economy, preferably the same noted for boiled beef.

For Soups—all bones, broken or sawed, and the particles of meat clinging thereto, left over meat can be worked in as noted in the recipes.

PORK FIGURE 3

First split the carcass into halves, then cut off the neck (A-B), and shanks C-D and E-F of the fore and hind quarters; remove the hind quarter by the cut G-H, and then the shoulder, using the knife only. Then cut in order, I-K, L-M, N-O, and P-Q.

V

Bills of Fare.

In the camps the cook not only is dependent upon the supplies at hand but also on the regulation and regularity in which the supplies come to camp, and as these often are irregular on account of the distance from headquarters, roads and weather conditions, it is impossible to make a system for the bills of fare.

The cook must use his own judgment always striving to get as big variation for each day as possible, taking care to have the proper things for breakfast and dinner and so much as possible have supper prepared in such a manner that the leavings from breakfast and dinner can be used to the best advantage.

BREAKFAST.

For breakfast always have hot biscuits or corn bread, bread, doughnuts and cake, cereals with milk varying with oat meal, corn meal mush, fried corn meal mush or hominy. Hot baked beans except Sundays and Holidays when sausage or liver and bacon should be served. Always have fresh made apple sauce or prunes on the breakfast table and good fresh made coffee.

DINNER.

If dinner is taken in camp this should be the most substantial meal of the day, consisting of bread, cold biscuit, if any, doughnuts, cake and cookies, soup, meat, vegetables, desserts and coffee or tea.

Soup should always be served, care being taken to vary the flavor and proper regard taken to the kind of meat previously boiled, for example if corn beef or ham has been cooked, bean or pea soup would be the right thing.

The table in the paragraph of meat cutting shows the use of the different cuts of meat to the best advantage, and the recipes and manual gives a great variation of cooking and serving the different grades of meat.

Besides potatoes always have cooked vegetable of some kind or other, taking care to vary as much as possible and that the vegetable will go good with the kind of meat that is going to be served.

Left over vegetables of all kinds, can with the best results, be used for soup or served cold as a salad.

DESSERTS.

Always serve a dessert of some kind or other for dinner in such a manner that the men will eat it as a dessert and not with the other food.

For dessert serve pies, stewed fruit, cakes, puddings, etc., always giving as much of a variety as the conditions allow.

SUPPER.

As this is the last meal of the day the kitchen should not only be emptied of left overs, but the men should be given some tasty light dishes that every one likes but which in themselves are not enough to do a hard day's work on.

Serve bread, cake and cookies, and your meat should as far as possible be made over from left overs and be either beef fritters, beef hash, potato or meat pie, fried ham, liver and bacon, corn beef stew, cod fish cakes, etc.

Tea should be served and a sauce of some kind or other. If the men can not come to the camp at noon, dinner should be served at night.

Table and Cooking Utens'ls.

(A camp for 50 men.)

TABLE UTENSILS.

All plates, cups, bowls, vegetable dishes and platters to be either enameled or agate ware.

Dinner Plates	50
Soup Plates	50
Coffee and Tea Dippers (1 pint)	50
Forks and Knives	50
Table Spoons	50
Tea Spoons	50
Vegetable Dishes, 6 inch	18
Platters, 8 inch	9
Soup Ladles	9
Sugar Bowls	9
Bowls for Sauce and Pickles	18
Vinegar bottles	9
Molasses Jugs	9
Pepper and Salt Shakers	9 of each

Bumpers, 2 qt.	18
Bumpers, 1 qt.	9

COOKING UTENSILS.

Roast Pan, 17x17x4 inches, heavy iron with cover	1
Biscuit and Cake Pans	6
Fry Pan	1
Bread Tins	18
Bean Pots, large	2
Lard Frying Kettle with Drainer	1
Beef Boilers, Heavy	2
Coffee and Tea Boilers	2
Kettles, Enameled	2
Wash Boilers	1
Pastry Board	1
Chopping Bowl	1
Lunch Buckets	
Fireless Cooker, complete	1
Meat Chopper	1
Water Pails	3
Mixing Pans	2
Dish Pans, large	2
Butcher Knives	1
Chopping Knives	1
Dippers, long handled	
Dippers, short handled	
Faucets	2
Nutmeg Grater	1
Sieves	1
Skimmers	3
Mixing Spoons	3
Carving Knife	1
Bread Knife	1
Meat Fork	1
Doughnut Cutter	1
Biscuit Cutter	1
Rolling Pin	1
Meat Cleaver	1
Meat Saw	1
Flour Sifter	1
Grease Brush	1
Can Opener	1

General Utensils.

Cook Stoves	2
Brooms	
Alarm Clock	1
Kerosene Oil Cans	2

Hanging Lamps	12
Hand Lamps	1
Lanterns	2
Matches	
Soap	
Towels	
Rags	
Scrubbing Pails	2
Mop Wringers	2
Mop Handles	2
Wash Basin	1
Wash Board	2
Pot Glove (or cleaner)	1
Brush for Pots, etc.	1

Measures and Weights

One Cup Means $\frac{1}{2}$ Pint.

2	Cups of	Lard	1	Pound
2 $\frac{1}{4}$	" "	Sugar	1	"
2	" "	Water or Milk	1	"
4	" "	Apples, Evaporated	1	"
2 $\frac{3}{4}$	" "	Peaches, "	1	"
2 $\frac{3}{4}$	" "	Prunes	1	"
2 $\frac{3}{4}$	" "	Raisins	1	"
3 $\frac{3}{4}$	" "	Flour	1	"
2 $\frac{3}{4}$	" "	Corn Meal	1	"
1 $\frac{1}{2}$	" "	Hominy	1	"
5 1-3	" "	Oatmeal	1	"
2	" "	Rice	1	"
2 $\frac{1}{4}$	" "	Beans	1	"
2 1-3	" "	Peas	1	"
2	" "	Minced Beef, Packed Close	1	"
5 1-3	" "	Coffee	1	"
8	" "	Tea	1	"
1	Bushel	Potatoes, Beets and Turnips	60	"
1	"	Carrots	50	"
1	"	Onions	52	"
1	Gill	Liquid	1 $\frac{1}{2}$	Cup
1	Heaping Tablespoon of	Sugar	1	ounce
1 $\frac{1}{4}$	"	" " Flour	1	"
2	"	" " Ground Coffee	1	"

What One Man Will Approximately Consume for One Meal.

1	Ounce	Sugar
1 $\frac{1}{2}$	"	Coffee
1	"	Cocoa
1-10	"	Tea
4	"	Dried Vegetables

4	"		Flour
8	"		Fresh Vegetables
4	"		Bacon or Salt Pork
8	"		of Meat Fresh
1-5	"		Salt
1-50	"		Pepper

BREAKFAST DISHES.

- 1 **Milk for Breakfast Foods (for 50 Men)**—Five 1 pound cans evaporated milk, 10 ounces Sugar.

Add a pinch of salt and sufficient water to make $2\frac{1}{2}$ gallons. Whip well a few minutes.

- 2 **Corn Meal Mush (for 50 Men)**—5 pounds corn meal or $3\frac{1}{2}$ quarts, 1 ounce of salt, 13 quarts of water.

Allow the water to come to a boil, and pour in the corn meal, meanwhile whipping well to prevent lumping. Allow to cook for about twenty minutes and then allow to stand about the same length of time where it will remain hot. Place in vegetable dishes and serve hot with milk and sugar ($1\frac{1}{2}$ lbs.)

- 3 **Corn Meal Mush Fried (for 50 Men)**—5 pounds corn meal or $3\frac{1}{2}$ quarts, 1 ounce salt, 13 quarts of water.

Prepare in the same manner as corn meal mush, pour into a well greased pan to a depth of about 1 inch and allow to cool. When cool, cut into pieces about 2 inches square; roll in a flour batter and fry in deep lard. Serve hot with syrup.

- 4 **Hominy (for 50 Men)**—5 pounds fine hominy or 2 quarts, 13 quarts of water.

When boiling add the hominy and boil from 20 to 30 minutes and season with salt; remove to the end of the range and let simmer for half an hour. Serve with milk.

- 5 **Oatmeal Mush (for 50 Men)**—5 pounds of oatmeal or 7 quarts, 1 ounce salt, 11 quarts of water.

Place the water in a boiler and allow it to come to a boil; whip the oatmeal in slowly and allow to boil for five minutes. Let simmer one-half hour and serve with milk and sugar.

SOUPS.

- 6 **Stock for Soup**

Save all bones that come into the kitchen, do not throw them away until all the nutriment has been extracted. Place the bones in the soup stock boiler, with sufficient cold water to cover them from 4 to 6 inches, and allow them to simmer until all the particles of meat attached to them have become loose.

There will probably now be sufficient soup stock in the boiler for immediate use.

Trim off the bones, saw or crack them, and place in the boiler again, adding more water, if necessary, and leaving the bones in the stock until all the nutriment has been extracted (this will require from six to nine hours.)

When boiled beef is prepared, more stock may be obtained.

If all the bones are saved they should produce sufficient stock for a soup each day, and for use in stews, gravies, etc.

- 7 Barley Soup (for 50 Men)**—5 gallons beef stock, $2\frac{1}{2}$ pounds Barley, $1\frac{1}{4}$ pound chopped onions.

Mix all ingredients well and allow to boil for one hour, when the soup will be ready to serve. Salt and pepper to taste. Regulate the amount of beef stock so that when the soup is ready to serve there will be about 5 gallons.

- 8 Bean Soup (for 50 Men)**—5 pounds beans or 3 quarts, 6-8 gallons water or beef stock, 5 pounds soup bone, $1\frac{1}{2}$ pounds bacon.

Clean and wash the beans well; place in the water (or beef stock) in a boiler near the center of the range and allow to simmer over night. About 7 a. m. add the soup bone and bacon; boil until about 10 o'clock, or until the beans have gone to pieces, and pass through a colander.

Place on the range again and allow to come to a boil; regulate the amount of stock or water so that, when the soup is ready to serve, there will be about 5 gallons; thicken with a flour batter and season with pepper and salt.

- 9 Beef Soup (50 Men)**—5 gallons beef stock, $2\frac{1}{2}$ pounds beef, 1 can tomatoes, $1\frac{1}{4}$ pounds of rice, (if desired.)

This soup can be made to best advantage on days when boiled beef is served. After boiling the beef until done, take it out and skim off the grease; dice $2\frac{1}{2}$ pounds beef to the size of a bean and add to the water (or stock); add the tomatoes and, if desired, the rice; regulate the amount of beef stock so that, when the soup is ready to be served, there will be about 5 gallons. Season to taste and serve hot.

- 10 Codfish Chowder (for 50 Men)**—5 pounds codfish shredded, $1\frac{1}{2}$ pounds onions, chopped, 7 pounds potatoes diced, 2 cans evaporated milk, if desired, 6 gallons of beef stock or water, $1\frac{1}{2}$ lbs. bacon, diced.

Fry the bacon and onions in a bake pan on the top of the range until brown; add the potatoes and cover well with stock; let boil until done; add the milk but do not allow to boil; season with pepper and salt. Regulate the amount of beef stock so that when the soup is ready to serve there will be about 6 gallons.

- 11 Macaroni Soup (for 50 Men)**—1 can tomatoes, (if desired), $2\frac{1}{2}$ pounds macaroni, 5 gallons beef stock.

Break the macaroni in pieces about 1 inch long and boil in the stock about forty minutes, add the tomatoes, season to taste with salt and pepper.

- 12 Rice Soup (for 50 Men)**— $2\frac{1}{2}$ pounds rice or $2\frac{1}{2}$ pints, 5 gallons beef stock, $\frac{1}{2}$ pound chopped onions browned, 1 pound bacon, diced and browned.

Wash the rice well, then add it, together with the bacon and onions, to the stock, and allow to boil for one whole hour, season to taste.

- 13 Pea Soup (for 50 Men)**—6 pounds peas or $3\frac{1}{2}$ quarts, 5 gallons beef stock, 1 pound bacon, diced and browned, 1 big onion.

Wash the peas and let stay in water over night. Add the peas and bacon and onion to the stock and let simmer all day; season to taste and serve hot.

- 14 Tomato and Rice Soup (for 50 Men)**—3 cans tomatoes, $1\frac{1}{2}$ pounds rice, or $1\frac{1}{2}$ pint, $4\frac{1}{2}$ gallons beef stock.

Wash the rice, mix all ingredients well, season with salt and pepper. Allow to boil for one hour or more, when it will be ready to serve.

- 15 Vegetable Soup (for 50 Men)**—1 pound cabbage, $\frac{1}{2}$ pound onions, 1 pound potatoes, $\frac{1}{2}$ pound rice, or $\frac{1}{2}$ pint, 1 can tomatoes, $4\frac{1}{2}$ gallons beef stock.

Mix all ingredients well; season to taste with salt and pepper, boil for one hour or more, when it will be ready to serve. Regulate the amount of beef stock so that when the soup is ready to serve, there will be about 5 gallons. Many other vegetables may be substituted for those given above.

MEATS.

- 16 Bacon and Cabbage (for 50 Men)**—12 pounds bacon, 25 pounds cabbage.

Cut, wash and clean the cabbage; place in the boiler with sufficient water to three-fourths cover the cabbage, place the bacon on top of the cabbage, after boiling two hours remove the bacon and allow the cabbage to boil one hour longer. To prevent discoloration, the boiler should be ventilated during the process of cooking. Serve hot. The bacon being sliced and placed on top of the cabbage.

- 17 Beef, Boiled (for 50 Men)**—25 pounds of beef.

Cut into pieces weighing about 5 pounds each; cover with water—preferably hot, in order to seal it and retain the juices—and allow to boil from two to three hours, according to the quality of the beef, salt to taste.

- 18 Beef Braised (for 50 Men)**—19 pounds beef, 1 pound onions, 2 pounds fat, $\frac{1}{2}$ pound flour, or 1 pint.

Dice the beef into 1 inch cubes; place the fat in the pan and allow to get hot; then put the beef in, together with the onions; put on top of the range or in a quick oven and stir frequently for about twenty minutes. Sift the dry flour in and allow to cook for about five minutes; add sufficient beef stock to nearly cover the meat and stir frequently. Season with salt and pepper and allow to cook until well done.

- 19 Brine for Corned Beef**—4 gallons of water, 2 pounds sugar, 8 ounces salt peter, 16 pounds of salt.

Dissolve and boil about fifteen minutes; pour into a 15 gallon keg and allow to cool. The brine should be prepared in the evening so that it will be given time to cool thoroughly before the meat is put in.

Cut the meat in pieces weighing about 5 pounds each and probe each piece with a steel at 1 inch intervals to allow the brine to penetrate all parts.

Place the meat in the brine and keep at a temperature of 50 to 60 degrees F from seven to nine days.

During the time the meat is in the brine it should be removed at least three times, alternating the upper and lower pieces. The above recipe is sufficient for corning 60 pounds.

- 20 Beef Fritters (for 50 Men)**—13 pounds of cooked meat, 7 pounds bread, $2\frac{1}{2}$ pounds of onions.

Soak the bread and remove the water by squeezing with the hands; grind the meat fine and add to the bread; mince the onions, and mix all together; salt and pepper to taste; mold into cakes of about 3 ounces each; roll in flour and fry in deep grease until brown. Serve hot with tomato sauce or gravy.

- 21 Beef Hash (for 50 Men)**—13 pounds potatoes, 2 pounds onions, 13 pounds meat scraps, etc., 5 quarts beef stock.

Chop the whole fine and add the beef stock until the mixture is of the consistency of ordinary mush; place about 3 inches deep in a well greased pan; smooth the top evenly with the hand and grease slightly; bake in a medium oven for one and one-half hours.

Scraps of beef or pork, a mixture of both, or corned beef may be used for making hash.

- 22 Beef Pot Pie (for 50 Men)**—20 pounds beef, — gallons stock,

Cut the beef into pieces about the size of a nut; fry slightly in a small amount of grease, and add sufficient stock, or water, to cover the meat. Allow to simmer until the meat will nearly fall apart, and season with salt, pepper and onions. Thicken slightly with flour batter, and place in a dish or pan at least 2 inches deep with a crust of biscuits spread over it. Place in the oven and brown in the same manner as ordinary pies.

- 23 Beef Roast (for 50 Men)**—25 pounds beef, 1 quart beef stock.

Cut the beef into pieces weighing about 5 pounds each; place in a quick oven and cook for about one-half hour, then dredge with salt, pepper and flour and add 1 quart of beef stock, adding more later if necessary.

The roast will then be sealed so as to retain the juices and the temperature of the oven should be allowed to diminish gradually, cooking the meat slowly from one to two hours more.

Baste frequently while roasting. Just before serving, cut in thin slices, across the grain, and retain all chunks of fat, bones, etc., as they would not be consumed if served, but can be used to great advantage in the kitchen. Serve hot with gravy.

- 24 Beef, Soft Roast (for 50 Men)**—20 pounds beef, 1 pound onions, fried brown, 2 pounds flour.

Use meat from the chuck, brisket, shoulder, or other inferior parts of the carcass; cut into 5 pound pieces; make a gravy of beef stock and flour batter; season well with pepper and salt; put the meat in the gravy and cook in a moderate oven until done. The gravy should cover the meat in the pan about one-half inch.

The browned onions should be added before cooking. Slice the meat and serve on a platter with hot gravy poured over it.

- 25 Beefsteak and Onions (for 50 Men)**—20 pounds beefsteak, without bones or fat, 12 pounds onions sliced, 1½ pounds fat, 2 quarts beef stock.

For directions for the selection of steaks see paragraph 2. Cut the steak into pieces weighing about 3 ounces each, and if tough beat each piece with the side of a claver.

Place the fat in a large bake pan, brown the sliced onions, add the beef stock and beef, season well with pepper and salt and set over a hot fire

until the stock is entirely evaporated, when the onions will be nearly done, allow to brown slightly, stirring frequently. Serve the steak on a platter and cover it with the onions.

26 Ham, Boiled (for 50 Men)—25 pounds ham.

Wash and scrape the ham, removing any part that may be decayed, place in sufficient water to cover it and allow to boil for 2 hours or more; remove from the range and allow to cool before taking from the water. Slice and serve either hot or cold.

27 Ham, Fried (for 50 Men)—25 pounds ham.

Trim and slice thin; if salty, parboil, fry in its own grease in the oven or on the top of the range.

28 Liver and Bacon in Gravy (for 50 Men)—15 pounds liver, 8 pounds bacon 6 pounds onions, browned; 2 pounds flour, 4 gallons stock.

Slice the bacon thin and wash in boiling hot water, not allowing it to remain in the water more than five minutes, fry quickly until medium well done.

Roll the slices of liver in flour and fry in the fat left after frying the bacon, add bacon and stock to the liver and onions to taste. Serve hot.

29 Pork Chops and Steaks (for 50 Men)—25 pounds lean pork.

Cut into pieces about one-half inch thick and weighing from 3.5 ounces each; fry in the same manner as beefsteak until done; or it may be breaded in flour or corn meal and fried. Serve hot with gravy or tomato sauce. After trimming the fat off the hog, about three-fourths of the meat can be cut into chops and steaks.

30 Pork Corned with Cabbage (for 50 Men)—20 pounds corned pork, 25 pounds cabbage.

Wash and clean the cabbage; place in a boiler with sufficient water to three-fourths cover the cabbage; place about one-third of the pork on top of the cabbage, cooking the remainder in a separate boiler.

Allow the cabbage to simmer about three hours and the pork about two. To prevent discoloration, the boiler should be ventilated during the process of cooking.

Serve hot, the pork being sliced and placed on top of the cabbage.

31 Pork, Roast (for 50 Men)—25 pounds lean pork.

Cut into pieces weighing about 5 pounds each; make slits along the sides of each piece, about one-fourth of an inch deep and one-half inch apart; place in a medium hot oven and allow to cook until well done—about two and one-half hours. Season to taste with pepper, salt and vinegar. Slice and serve hot with apple sauce.

32 Pork Sausage (for 50 Men)—22 pounds link sausage.

Boil for 5 minutes; puncture the skin of each link with a fork, place in a pan, and fry quickly until a delicate brown.

33 Potato Pie (for 50 Men)—20 pounds potatoes, boiled and mashed, 12 pounds beef, diced; 3 pounds onions, browned.

Season the mashed potatoes with pepper and salt, put a layer of potatoes about half an inch thick in a vegetable dish, roll the beef in flour, season with salt and pepper and fry brown in a little fat, brown the

onions and mix with the beef; add a little beef stock, and cook for about 15 minutes; place a thin layer of chopped onions inside of the layer of potatoes in the vegetable dish, fill up with the mixture of meat.

Place a layer of mashed potatoes on the top and round off nicely. Grease well and bake until nicely browned. Serve hot in the dish in which baked.

- 34 Irish Stew (for 50 Men)**—15 pounds beef, 20 pounds potatoes, 4 pounds carrots, 4 pounds onions.

Cut the beef in small pieces; add sufficient beef stock or water to just cover the beef; allow to simmer for one hour; add the vegetables, and allow to cook until done. Season to taste with pepper and salt, and thicken slightly with a flour batter. Serve hot with or without dumplings.

- 35 Corned Beef Stew (for 50 Men)**—20 pounds corned beef, diced; 20 pounds potatoes, diced; 3 pounds salt pork, diced fine; 2 pounds onions, cut fine.

Cover the diced beef with sufficient beef stock or water to just cover the beef; allow to simmer for one hour, add the diced potatoes, and salt pork and onions, and more stock if necessary; cook until done, season with salt and pepper and serve hot.

- 36 Boiled Dinner (for 50 Men)**—20 pounds of corned beef, 10 pounds cabbage, 8 pounds turnips.

Wash and clean cabbage and turnips, place in a boiler with sufficient water to three-fourths cover the vegetables. Place about one-third of the beef on top of the vegetables cooking the remainder in a separate boiler; allow the vegetables to simmer about 3 hours, and the meat from 2-3 hours.

One-half hour before vegetables are ready put in the potatoes. To prevent discoloring, the boiler should be ventilated during the cooking. Serve hot, the corned beef being sliced and placed on top of the vegetables.

- 37 Venison Roast (for 50 Men)**—25 pounds venison, ham preferred.

Cut into pieces weighing about 5 pounds each; lard well with salt pork every 2 inches, the strips of fat being well seasoned with pepper and salt; roast in the same manner as beef, except that it should always be well done.

Other parts may be roasted in the same manner but will require less roasting according to the size of the pieces. Parts not suitable for roast, may be utilized in steaks, hash, stews, fritters, mince meat, etc.

FISH.

- 38 Baked Fish (for 50 Men)**—25 pounds fish, 2 pounds bacon or salt pork.

Fish weighing 5 pounds or more are preferred. Dress and place in a bake pan with 3 or 4 slices of bacon over each fish, and about 1 inch of water in the pan. Season well with pepper and salt, place in hot oven and bake one hour, basting frequently and allowing the oven to cool gradually while baking. Serve hot.

- 39 Boiled Fish (for 50 Men)**—25 pounds fish.

Fish weighing from 5 pounds upward are preferred. Take a large bake pan half full of boiling water and place in a hot oven; place the fish in the water, add a little salt and bring to a boil as soon as possible, using only sufficient water to barely cover the fish. Allow to simmer until the meat may be easily separated from the bone. Should be served with cream sauce, or with melted butter over it.

- 40 Cod Fish, Salt, Boiled (for 50 Men)**—20 pounds salt codfish.

Break the fish into pieces weighing about 2 ounces each; allow to boil for 15 minutes to remove the salt, change the water and boil until done. Serve hot with cream sauce.

- 41 Fried Fresh Fish (for 50 Men)**—25 pounds fresh fish.

Clean and slice (or split) into pieces not more than 1 inch thick; roll in flour or corn meal, and fry in deep lard until thoroughly browned. Serve hot with pickles, and, if practicable, tomato sauce.

- 42 Codfish Cakes (for 50 Men)**—10 pounds salt codfish, 10 pounds potatoes, boiled; 2 cans evaporated milk.

If whole cod is used, soak, boil, remove the bones, and pass through a meat chopper; mix with the potatoes and milk, season to taste with pepper and salt, and mold into cakes weighing about three ounces each.

Roll in flour and fry in deep fat. Serve hot with tomato gravy.

- 43 Cream Sauce for Codfish (for 50 Men)**—1 pound fat, 4 12 ounce can evaporated milk, $\frac{1}{2}$ pound onions, minced; $\frac{1}{2}$ pound pickles, minced.

Thicken 1 gallon of boiling water with a flour batter, and season well with pepper and salt; let come to a boil and add the fat, milk with onions and pickles; whip well and spread over the fish on the platter or serve separate.

VEGETABLES.

- 44 Beans baked (for 50 Men)**—11 pounds of beans, 2 pounds of salt pork, diced; 4 ounces sugar, or $\frac{1}{2}$ pint molasses.

Soak the beans for one hour and wash thoroughly in cold water; par-boil until skin breaks; wash again; place beans and pork in layers in bean pot, together with enough hot water to cover the beans, salt, pepper and mustard to taste; place in the oven about 2 p. m., if the beans are to served in the morning. Add more water in the evening if necessary and do not let the fire go out in the oven over night. In the morning the beans will be ready to serve. Serve hot with some kind of pickles or tomato sauce.

- 45 Beets Boiled (for 50 Men)**—22 pounds beets.

Wash the beets thoroughly and boil until well done; rub the skin off with hands, cut into slices, season with pepper and salt and serve hot.

- 46 Cabbage Boiled (for 50 Men)**—30 pounds cabbage, 5 pounds salt pork.

Strip off the outer leaves and cut out the core, wash and place in a boiler, parboil for say 15 minutes, change water, add the pork, season with salt and allow to boil in an open boiler for about three hours—add more water if necessary. Serve hot.

- 47 Cabbage Fried (for 50 Men)**—22 pounds cooked cabbage, 2 pounds bacon drippings.

Chop the cabbage fine and add the bacon drippings; set on range in a covered pan and let fry about one-half hour, stirring frequently to prevent burning. Season with pepper and salt. Serve hot.

- 48 Carrots Boiled (for 50 Men)**—22 pounds of carrots, 1 pound bacon drippings.

Scrape and wash the carrots well and place in an open boiler; cover with water and boil until thoroughly done; remove and place in a bake

pan with the bacon drippings; season with salt and pepper and bake in a quick oven for about twenty minutes, when they will be ready to serve.

- 49 Carrots Mashed (for 50 Men)**—22 pounds carrots, 4 quarts beef stock, 1 pound bacon drippings.

Peel the carrots and cut in slices not more than one-half inch thick; place in an open boiler and pour in the beef stock; cook slowly until thoroughly done. When done, pepper and salt to taste, add the bacon drippings and mash thoroughly. Serve hot.

- 50 Macaroni and Tomatoes (for 50 Men)**—5 pounds macaroni, 2 cans tomatoes.

Break the macaroni into inch lengths and boil in 4 gallons of salted water until tender. Drain and put a layer of macaroni in the bottom of greased pan, sprinkle with pepper, salt and onion juice, cover with a layer of stewed tomatoes. On this goes another layer of macaroni and so on until the dish is full. The topmost layer must be of tomatoes sprinkled with crumbs and bacon drippings. Set in a hot oven covered for twenty minutes, and then bake uncovered until the crumbs are well browned.

- 51 Onions, Boiled (for 50 Men)**—22 pounds onions.

Select medium onions, boil from one-half to three-fourths of an hour, season with salt and pepper, and serve with or without cream sauce.

Left-over boiled onions may be used in making gravy, hash, stewed potatoes or lyonnaise potatoes.

- 52 Onions, Fried (for 50 Men)**—12 pounds onions, peeled and sliced; 1 pound lard or drippings, 2 quarts beef stock.

Put all in a bake pan on top of the range, with a hot fire. When the water is all evaporated, the fat in the pan will be sufficient to brown the onions. Stir frequently and season with pepper and salt.

May be served with beefsteak or as a vegetable.

- 53 Potatoes, Baked (for 50 Men)**—22 pounds potatoes.

Select potatoes of about the same size, wash well and place in the smaller of two pans, rub a little grease over each potato with the hands and cover with the larger pan; bake until done usually about one hour. Pinch each potato to break the skin, just before serving.

- 54 Potatoes, Boiled (for 50 Men)**—22 pounds potatoes.

Peel and put in cold water; salt and allow to boil slowly until thoroughly done (about twenty to forty minutes); strain thoroughly; remove the lid, replace on the range, and allow the potatoes to remain about three minutes longer. Serve in vegetable dishes.

- 55 Potatoes, Browned (for 50 Men)**—22 pounds potatoes.

Select the small potatoes; wash and boil them until done; peel and add sufficient fat to grease well. Having mixed the potatoes, spread over the bottom of a well greased bake pan in a single layer, and bake in a brisk oven until brown, usually about thirty minutes.

- 56 Potato Cakes (for 50 Men)**—22 pounds potatoes, boiled; 1 pound of flour, 1 can evaporated milk.

Run the potatoes through a meat chopper, mix with the milk, season with pepper and salt, and roll into cakes weighing 3 ounces each; roll in flour and fry in deep lard until nicely browned. Serve as a vegetable with any kind of meat.

Left over potatoes prepared in any manner may be used in this recipe.

- 57 Potatoes, Creamed (for 50 Men)**—22 pounds potatoes, 1 gallon beef stock, 1 can evaporated milk.

Boil the potatoes until well done; peel and slice crosswise; allow the beef stock to come to a boil on the range, thicken with a flour batter and add the evaporated milk. Place the potatoes in a bake pan and pour the mixture over them, it being just about sufficient in quantity to cover the potatoes. Allow to come to a boil and remove from the range immediately. Salt and pepper to taste.

- 58 Potatoes, Fried (for 50 Men)**—22 pounds potatoes.

Wash the potatoes and boil until they may be easily pierced with a fork; peel and slice crosswise; season with salt, adding sufficient fat to moisten; spread over the bottom of a well greased bake pan to the depth of about 2 inches, and bake in a brisk oven for about thirty minutes.

- 59 Potatoes, French Fried (for 50 Men)**—22 pounds of potatoes, peeled.

Cut lengthwise into one-half inch slices, and fry in deep lard until nicely browned; after frying, dust slightly with salt, and serve hot with any kind of meat.

On account of the quantity of potatoes to be prepared for a lumber camp, it is not advisable to cut in thin slices, as is usually done.

This is a dish much relished by the men, and is recommended for frequent use.

- 60 Potatoes, Hashed (for 50 Men)**—22 pounds potatoes, 1 gallon beef stock.

Cut the cooked potatoes into pieces about the size of a bean, season with salt and pepper, and mix with the beef stock, the same as when making hash; spread 2 or 3 inches deep over the bottom of a well greased pan, spread a little fat over the top and bake for about thirty minutes in a quick oven.

- 61 Potatoes, Lyonnaise (for 50 Men)**—22 pounds potatoes, 2 pounds onions.

Wash the potatoes and boil them until they may be easily pierced with a fork; peel and slice crosswise; peel and slice the onions, fry brown and add to the potatoes.

Season with pepper and salt, adding sufficient fat to moisten, and spread about 2 inches deep in the bottom of a well greased bake pan, bake about thirty minutes in a quick oven.

- 62 Potatoes, Mashed (for 50 Men)**—22 pounds potatoes, 1 quart beef stock, 1 can evaporated milk.

Peel, wash in cold water, and boil until thoroughly done; strain, salt and mash well, adding the stock and milk. Whip well with a basting spoon for about five minutes and serve hot.

- 63 Sauer Kraut (for 50 Men)**—5 gallons sauer kraut, 3 gallons beef stock.

Season to taste and allow to simmer for about two hours. Sauer kraut should be cooked with some kind of meat.

- 64 Tomatoes, Stewed (for 50 Men)**—6 cans tomatoes.

Remove from the cans, place in the stew pot and add 2 ounces of sugar and one-half pound of bacon dripping; pepper and salt to taste, and

if desired, add bread and beef stock. Place on the range, allow to come to a boil and serve immediately.

- 65 Turnips, Boiled (for 50 Men)**—22 pounds of turnips, 5 pounds bacon or salt pork.

Peel and cut in half inch slices; cover with water, add the bacon (or salt pork) season with pepper and salt, and allow to boil until done. Serve hot.

- 66 Turnips, Mashed (for 50 Men)**—22 pounds turnips, 5 pounds salt pork.

Prepare as directed in the preceding paragraph, and mash well before serving.

Turnips left over from a meal may be served again when prepared as follows: Place in vegetable dishes, cover with a few strips of bacon or salt pork; place in the oven until slightly browned, say fifteen minutes—when they will be ready to serve.

SALADS.

- 67 Bean Salad (for 50 Men)**—15 pounds baked beans, 3 pounds onions, chopped fine; 2 pounds pickles, chopped fine.

Mix thoroughly and season with salt and pepper, mustard, and vinegar. Serve cold. Baked beans left over are frequently available for salads.

- 68 Piccalilli Salad (for 50 Men)**—3 pounds cabbage, minced; 1 can tomatoes, 3 pounds onions, minced; 3 pounds pickles, minced; 1 pint vinegar.

Mix all the ingredients well; season with salt and pepper and cloves, and add sufficient water to make 2 gallons. Serve with baked beans or meat of any kind.

- 69 Pickled Beets (for 50 Men)**—20 pounds beets.

Boil the beets until done and rub the skins off with the hand; cut into quarter inch slices, season with salt and vinegar, and allow to stand about five hours before serving. Serve cold.

- 70 Potato Salad (for 50 Men)**—20 pounds potatoes, 1 pound onions, minced; 1 pound bacon, fried and browned; 1 pint water, 1 pint vinegar.

Boil the potatoes until well done; peel and cut crosswise into thin slices, place the potatoes in a bowl with onions over them; fry the bacon until brown, and while still hot dash over the potatoes, and add the vinegar and water. Mix well, pepper and salt to taste, and allow to stand for two hours before serving.

- 71 Slaw (for 50 Men)**—25-30 pounds cabbage, 2 pounds bacon, diced and browned; 6 pounds onions, 1½ quarts vinegar.

Wash the cabbage thoroughly, and chop it fine, add the onions, bacon and vinegar, and season to taste with pepper and salt. Mix thoroughly and let come to a boil in a closed vessel, when it will be ready to serve.

Serve hot or cold as desired.

- 72 Sliced Onions (for 50 Men)**—12 pounds of onions.

Peel and wash the onions, cut into thin slices and serve without a dressing or with a dressing made of pepper, salt and vinegar. If desired onions and pickles or onions, pickles and cabbage, may be used in equal proportions.

- 73 Vegetable Salad (for 50 Men)**—10 pounds of cooked vegetables.

Nearly any kind of left over cooked vegetables separate or mixed, may be used in making vegetable salads by seasoning with mustard, vinegar and bacon grease.

DESSERTS.

- 74 Apple Rolls (for 50 Men)**—5 pounds flour, $2\frac{1}{2}$ pounds lard, 5 quarts stewed apples.

Prepare the dough the same as for pies, and the apples the same as for apple pies, but a little drier, roll the dough out into strips about 7 inches wide and a little longer than the width of the pan; set the farther end of the pan up about 4 in. from the table; spread one of the strips of dough across the lower end of the pan and place the apples for one roll on this strip; fold the farther side of the strip of dough over toward you and then fold the nearer side from you, tucking it under the roll. Continue making the rolls in the same manner—rolling them up like a cigarette—and placing them in succession beyond the previous made. When the pan is filled, trim off the ends with a knife. In no case should the rolls be over 3 inches thick. Bake about forty minutes; cut lengthwise of the pan into pieces about 3 inches long. Serve hot or cold.

Any kind of stewed fruit may be substituted for the apples, and the rolls named accordingly.

- 75 Apple Sauce (for 50 Men)**—5 pounds evaporated apples.

Place the apples in three times their bulk of water and allow to come to a boil; remove to a part of the range where they will only simmer.

After two hours, remove and season with sugar to taste and flavor with lemon extract. Serve cold with cake.

- 76 Brown Betty (for 50 Men)**— $7\frac{1}{2}$ pounds bread or bread scraps, 5 pounds caramelized sugar, 3 pints; 2 pounds raisins of $2\frac{3}{4}$ pints.

Dice the bread into one inch cubes and brown in a slow oven; place 3 gallons of water on the range and add the caramelized sugar and raisins; thicken slightly with a flour batter; pour over the diced toast. Let cook in the oven about twenty minutes and serve hot.

- 77 Prunes, Stewed (for 50 Men)**—5 pounds prunes, or $6\frac{1}{2}$ pints.

Place the prunes in a boiler with about three times their bulk of water and set on a part of the range where they will keep hot but not boil.

After two hours remove and season to taste with cinnamon, cloves, or nutmeg, a little vinegar, sugar. Apples, peaches and other fruits may be prepared in the same manner. Serve cold.

- 78 Pudding, Apple (for 50 Men)**—4 pounds apples or 1 quart, 16 pounds bread, 4 pounds sugar, $4\frac{1}{2}$ pints; 2 ounces cinnamon.

Stew the apples in $1\frac{1}{2}$ gallons water; slice the bread and toast it; spread the toast in the bottom of a well greased bake pan; then spread over it a layer of the apples, sprinkled with sugar and cinnamon, continue alternate layers of toast and apples until all is used; bake in a quick oven about twenty minutes and serve.

Nearly any kind of fresh or dried fruit may be used and the pudding named accordingly.

- 79 Pudding, Bread (for 50 Men)**—10 pounds of bread scraps, 1 2-3 pounds dried fruit, $2\frac{1}{4}$ quarts; 1 2-3 pounds sugar, 2 pints; 1 ounce cinnamon, 2 cans evaporated milk.

Soak the bread in cold water and squeeze out well with the hands; season well with sugar and cinnamon, mix well with the milk and spread about 1 inch deep in pans; over this spread about 1 inch of stewed fruit; then another layer of bread, and over the top spread sugar and cinnamon; bake about forty minutes in a medium hot oven. Serve hot or cold.

- 80 Pudding, Corn Starch (for 50 Men)**—4 pounds sugar, $4\frac{1}{2}$ pints; 1 ounce salt, 3 packages corn starch, 4 cans evaporated milk, 1 ounce flavoring extract.

Dissolve the corn starch in about 3 quarts cold water, when dissolved add to 3 gallons of boiling water; add the sugar and milk, and after cooking five minutes remove from the range, cool and add the flavoring.

Pour into vegetable dishes, serve cold.

- 81 Pudding, Tapioca (for 50 Men)**—3 quarts water, 18 ounces tapioca, $1\frac{1}{2}$ pounds sugar.

Add the tapioca to boiling water, and immediately put the boiler on a place of the range so it does not boil, allowing it to stand for about two hours.

Serve with milk sauce. Raisins, as well as any kind of flavoring extract, may be added.

- 82 Pudding, Plum (for 50 Men)**—2 pounds sugar, $2\frac{1}{4}$ pints; 3 pounds dried fruit chopped fine, $4\frac{1}{2}$ pints; 3 pounds beef suet, chopped fine; $1\frac{1}{2}$ ounces salt, $\frac{1}{4}$ ounce cloves, 1 ounce cinnamon, $\frac{1}{4}$ nutmeg, 4 ounces baking powder, 6 pounds flour, $5\frac{1}{2}$ quarts.

Mix the flour, baking powder, salt, beef suet, fruit and spices, in the order named; dissolve the sugar in water, and add together with sufficient cold water to make a stiff dough; use 5 pound lard pails or pudding cans and fill each about two thirds full of the mixture. If no lids are provided, tie a cloth tightly over the top of each pail or can.

Place in a boiler containing sufficient boiling water to one-third submerge the pails or cans and maintain the water at about the same height during the process of cooking by the addition of more boiling water when necessary. Boil from five to eight hours. Remove from the cans, split lengthwise through the center, and serve in large vegetable dishes with sauce prepared as follows.

- 83 Sauce for Plum Pudding (for 50 Men)**— $1\frac{1}{2}$ pounds sugar, $1\frac{1}{2}$ pints; 1 tablespoonful lemon extract, $\frac{1}{2}$ pint vinegar, 1 can evaporated milk, $\frac{1}{2}$ ounce salt.

Dissolve the sugar in a gallon of water, let come to a boil and after boiling about two minutes, remove from the range and add the vinegar, milk and salt. Whip a few minutes and serve hot.

BREAD, CAKES, PIES, ETC.

- 84 Bread Raised (for 50 Men)**—8 tablespoons sugar, 4 cakes Magic Yeast, 4 quarts water, 12 pounds flour, 11 quarts; 8 teaspoonfuls salt, 8 table-spoonfuls lard.

In the evening soak 4 cakes Magic Yeast in 2 quarts luke warm water about one hour. When dissolved mix with 4 pounds flour to medium sponge, cover sponge, let rise in warm place over night. Early in the morning mix sponge with 2 quarts warm water, 8 teaspoonfuls salt, 8 table-spoons sugar, 8 teaspoonfuls lard. Add 8 pounds flour, mix to medium dough. Knead dough about 15 minutes, let rise $2\frac{1}{2}$ to 3 hours. Knead dough down, let rise about one hour, mould into loaves.

Let loaves rise to double size, bake 45 minutes to one hour in moderate oven.

Warm flour before mixing. Do not allow materials to become chilled.

- 85 Biscuits (for 50 Men)**—11 pounds flour, $9\frac{1}{2}$ quarts; $11\frac{1}{4}$ pounds lard, $11\frac{1}{4}$ pints; 2 ounces sugar, 2 ounces salt, 10 ounces baking powder.

Mix the dry ingredients and sift; work in the lard and mix thoroughly, add sufficient water to make a soft dough; roll out about one-half inch thick, cut out with a biscuit cutter and place in a bake pan one-half inch apart. Bake in medium hot oven until done; serve hot.

- 86 Bread, Corn (for 50 Men)**—5 pounds corn meal, $3\frac{1}{2}$ quarts; 3 pounds flour, $5\frac{1}{2}$ pints; $11\frac{1}{2}$ ounces sugar, $\frac{1}{2}$ pound lard, $\frac{1}{2}$ pint; 8 ounces baking powder.

Mix the ingredients and sift; work in the lard and mix thoroughly; add sufficient water to make a soft dough, spread in bake pans to depth of two inches, and bake in an oven for about forty minutes.

- 87** Take all the good scraps of bread, using up that which might otherwise be wasted; place in a dripping pan in a slow oven for about one hour; leave the oven door slightly ajar to allow the moisture to escape; when thoroughly dried out, pass through a meat chopper and then grind fine with a bottle. Keep in a dry place and use for rolling meats for frying.

- 88 Doughnuts (for 50 Men)**—1-16 ounce can evaporated milk, 2 quarts of water, 7 pounds sugar, 4 quarts; 12 teaspoons baking powder, 2 tablespoons salt, 1 teaspoon nutmeg, $\frac{1}{2}$ pound cold lard, $\frac{1}{2}$ pint; 8 pounds flour, $7\frac{1}{2}$ quarts.

Cream the sugar and lard; add milk, water, salt and nutmeg; mix together with enough flour, sifted, together with the baking powder, to make a good stiff dough. Roll out, cut into rounds and fry in lard to a golden brown, drain, cool and pack away.

- 89 Sugar Cake (for 50 Men)**—4 pounds sugar, $4\frac{1}{2}$ pints; $\frac{1}{2}$ pound lard, $\frac{1}{2}$ pint; 1 teaspoon salt, 1 nutmeg, 1 tablespoon molasses, 4 quarts water, 6 teaspoons baking powder, 6 pounds flour, $5\frac{1}{2}$ quarts.

Cream the sugar and lard, add salt, nutmeg, molasses and water; mix with enough flour, sift it together with the baking powder, to make a light dough; pour into well greased pans about $1\frac{1}{2}$ inches thick, bake in a moderate oven until done. Let cool and cut in small pieces as required.

- 90 **Molasses Cake (for 50 Men)**— $1\frac{1}{2}$ quarts molasses, 1 pound sugar, 1 pint; 3 tablespoons melted lard, $1\frac{1}{2}$ tablespoon salt, 1 teaspoon ginger, 4 quarts water, 2 teaspoons soda, 6 pounds flour, $5\frac{1}{2}$ quarts.

Mix well together the molasses, sugar, lard, salt, ginger and water, mix in enough flour—sifted together with the soda—to make a light dough, pour into well greased baking pans about $1\frac{1}{2}$ inches thick; and bake in a moderate oven until done. Let cool and cut in small pieces as required.

- 91 **Marble Cake**— $\frac{1}{2}$ portion sugar cake dough, $\frac{1}{2}$ portion molasses cake dough.

Pour into well greased pans 1 spoonful of each kind alternately until the layer is about $1\frac{1}{2}$ inch deep. Bake in a moderate oven until done; let cool and cut in small pieces as required.

- 92 **Sugar Cookies**— $4\frac{1}{2}$ pounds sugar, $2\frac{1}{2}$ quarts; $1\frac{1}{2}$ pounds lard, $1\frac{1}{2}$ pints; 3 pints water, 1 heaping teaspoonful nutmeg, 2 tablespoons salt, 9 teaspoons baking powder, $9\frac{1}{4}$ pounds flour, $8\frac{3}{4}$ quarts.

Cream sugar and lard well together; add salt, nutmeg and water; mix well, add enough flour—sifted with the baking powder—to make a stiff batter; roll out thin, cut with a biscuit cutter and place in a greased pan. Bake in a moderate oven until done; let cool and pack away.

- 93 **Ginger Cookies**—3 pints molasses, $4\frac{1}{2}$ pounds sugar, $2\frac{1}{2}$ quarts; $1\frac{1}{2}$ pounds melted lard, $1\frac{1}{2}$ pints; $1\frac{1}{2}$ pints water, 3 teaspoons ginger, 3 ounces soda, $9\frac{1}{4}$ pounds flour, $8\frac{3}{4}$ quarts, 2 tablespoons salt.

Mix molasses, sugar, lard, water, ginger and salt well together; add enough flour (sifted with the soda) to make a stiff batter. Roll out thin, cut out and put in a greased pan. Bake in a moderate oven until done; let cool and put away.

- 94 **Ginger Bread**—3 pints molasses, 3 pints water, 2 pounds crumbs, 1 pound melted lard, 1 pint; $\frac{1}{2}$ teaspoon ground nutmeg, 2 teaspoons ginger, 1 teaspoon cinnamon, $1\frac{1}{2}$ ounce soda, $1\frac{1}{2}$ ounces cream tartar, 6 pounds flour, $5\frac{1}{2}$ quarts.

Mix all ingredients (except flour) thoroughly, add enough flour (sifted together with soda and cream tartar) to make a good batter; pour in well greased baking pans about 2 inches thick, and bake in a moderate oven until well done. Let cool and cut in small squares as required.

- Pie Crust (for 12 double, 9 inch crusts)**— $4\frac{1}{2}$ pounds flour, $4\frac{1}{2}$ quarts; $2\frac{1}{2}$ pounds lard, $2\frac{1}{2}$ pints; 1 ounce salt.

Rub together lightly but thoroughly. The whole secret of a good crust is just the proper mixing. If worked too hard the result is poor. Furthermore great care should be taken not to put in too much water, this is very important. Pies are better if the filling is put in cold.

- 96 **Apple Pie Filling**—6 pounds evaporated apples, 3 pounds sugar, 2 quarts water, 1 teaspoon cinnamon.

Add the sugar and spices to the stewed apples and mix well. Make the pies with a double crust and bake about twenty minutes. Nearly any kind of fruit may be substituted for the apples in the above recipe.

- 97 Raisin Pie Filling**— $\frac{1}{2}$ pound corn starch, $4\frac{1}{2}$ pounds raisins, 3 quarts $3\frac{1}{2}$ pounds sugar, 2 quarts; 3 quarts water, 1 teaspoon nutmeg, $\frac{1}{2}$ teaspoon cloves, 1 teaspoon salt, $\frac{1}{2}$ pint water.

Stew and mix well, thicken with a batter of corn starch and water. When cold fill the pies as above and bake for about 20 minutes.

- 98 Lemon Pie Filling**—10 pounds prepared filling, 3 pounds of sugar, 3 $\frac{1}{4}$ quarts.

Mix thoroughly; fill and bake as apple pies.

MINCE MEAT FOR 40 PIES.

- 99** 10 pounds evaporated apples, well soaked and chopped, $4\frac{1}{2}$ pounds boiled beef, $1\frac{1}{2}$ quarts molasses, 3 heaping tablespoons cloves, 1 heaping tablespoon nutmeg, $3\frac{1}{4}$ pounds sugar, $3\frac{1}{2}$ quarts; 4 quarts beef stock, $\frac{1}{2}$ pint vinegar, $4\frac{1}{2}$ pounds raisins, $1\frac{3}{4}$ pounds suet.

Run the beef suet, apples and raisins through the meat chopper, each separately; mix well with the rest and boil for 2 hours.

When cold fill in the pies, using a double crust; bake for about 20 minutes. Serve hot or cold.

Variations of the above are made in many ways. Deer meat is excellent for mince pie and should be used when possible.

DRINKS.

- 100 Coffee (for 50 Men)**—Coffee is generally served for breakfast and dinner, and should always be prepared fresh at least once a day. The following method is suggested.

Breakfast Put $6\frac{1}{4}$ gallons of water in the boiler and let come to a boil, add 2 pounds roasted and ground coffee, and remove from range immediately.

Allow to stand fifteen minutes; add 1 pint of cold water and allow to stand a few minutes longer.

Dinner—Allow the grounds to remain in the boiler and add sufficient water to make $6\frac{1}{4}$ gallons; allow to come to a boil and add 1 pound of coffee, remove from the range and allow to stand for 15 minutes, add a pint of cold water, and allow to stand a few minutes before serving.

Coffee should be made for immediate use only.

- 101 Tea**— $6\frac{1}{4}$ gallons water, 5 ounces good tea.

Allow the water to come to a boil; suspend the tea from the top of the boiler in a muslin cloth bag and allow to stand in the boiling water for five minutes. The bag should be sufficiently large to give the tea plenty of room so that the boiling water will penetrate all portions of it.

Remove the leaves and serve immediately.

ATTENDANCE.

NAME	POSITION	COMPANY	ADDRESS
Allaire, L. C.	Local Manager	The Quebec & St. Maurice Industrial Co.	Moulin Beaupre, P. Q.
Anderson, G. E.	Scaler	Berlin Mills Company	Berlin, N. H.
Bailey, Fred	Purchasing Agent	The Quebec & St. Maurice Industrial Co.	Berlin, N. H.
Barbin, R. J.	Bookkeeper	"	Notre Dame du Rosaire, P. Q.
Bennett, W. L.	"	"	Berlin, N. H.
Bignell, W. J.	Inspector	"	La Tuque, P. Q.
Billard, F. H.	Forester	"	Berlin, N. H.
Bowker, A. L.	Storehouse Manager	Berlin Mills Company	Millsfield, N. H.
Bradbury, H. L.	Bookkeeper	The Quebec & St. Maurice Industrial Co.	St. Raymond, P. Q.
Brady, W. J.	District Manager	"	St. George, Beauce, P. Q.
Brown, D. P.	"	"	La Tuque, P. Q.
Brown, Simmons	Purchasing Agent	"	Quebec, P. Q.
Brown, W. R.	General Manager	All Companies	Berlin, N. H.
Carter, A. M.	Timber Estimator	Berlin Mills Company	Berlin, N. H.
Carter, H. F.	"	"	Berlin, N. H.
Carter, J. H. Jr.	Inspector	The Quebec & St. Maurice Industrial Co.	La Tuque, P. Q.
Cassidy, J. S.	"	"	Sherbrooke, P. Q.
Churchill, P. W.	General Office Mgr.	Berlin Mills Company	Berlin, N. H.
Coleman, N. H.	Surveyor	The Quebec & St. Maurice Industrial Co.	La Tuque, P. Q.
Corbett, J. C.	Local Manager	Beaurivage Lumber Co.	Craigs Road, P. Q.
Curran, H. P.	Storehouse Manager	Fitzgerald Land & Lumber Company	Johnson, Vt.
Curtis, Alphonso	Head Scaler	Berlin Mills Company	Berlin, N. H.
De Carteret, S. L., C. E.	Local Manager	The Quebec & St. Maurice Industrial Co.	St. Raymond, P. Q.
Deschambault, J. D.	Bookkeeper	"	St. George, Beauce, P. Q.
Delaney, J. P.	Walking Boss	Berlin Mills Company	Berlin, N. H.
Elliot, C. A.	Bookkeeper	The Quebec & St. Maurice Industrial Co.	Lyster, P. Q.
Farrington, F. W.	Scaler	"	Berlin, N. H.
Fletcher, H. B.	District Manager	"	Sherbrooke, P. Q.
Ford, Ellery	Mill Superintendent	"	St. Marie, Beauce, P. Q.
Gibbons, Ed.	Veterinary	Berlin Mills Company	Berlin, N. H.
Goggins, Charles	Inspector	"	"
Graft, J. H.	Draftsman	"	"
Gregory, H. S.	General Office Mgr.	The Quebec & St. Maurice Industrial Co.	"
Gurnett, L. G.	Financial Agent	Berlin Mills Company	Portland, Me.
Heck, J. F., F. E.	Forester	The Quebec & St. Maurice Industrial Co.	St. Raymond, P. Q.
Hindle, H.	Walking Boss	Berlin Mills Company	Berlin, N. H.
Hoffses, W. M.	Purchasing Agent	"	Portland, Me.
Keenan, J. W.	District Manager	Fitzgerald Land & Lumber Company	Island Pond, Vt.
Keens, P. B.	Bookkeeper	The Quebec & St. Maurice Industrial Co.	Moulin Beaupre, P. Q.
King, F. C.	Storehouse Manager	Berlin Mills Company	Oquossoc, Me.
King, G. E.	Bookkeeper	"	Berlin, N. H.
Laferrriere, A. L.	Local Manager	The Quebec & St. Maurice Industrial Co.	Victoriaville, P. Q.
Laffin, J. E.	Storehouse Manager	Fitzgerald Land & Lumber Company	Island Pond, Vt.
Laffin, William	Local Manager	Berlin Mills Company	Berlin, N. H.
Linn, Ed. R., F. E.	Forester	"	"
Linton, D. W.	Traffic Manager	"	"
Lockyer, S. S., F. E.	Forester	"	"
Mack, T. E.	Purchasing Agent	The Quebec & St. Maurice Industrial Co.	La Tuque, P. Q.
McCrystle, P.	Scaler	"	Berlin, N. H.
Mahaney, Wm.	Head Inspector	Berlin Mills Company	"
Marcotte, J. W.	Bookkeeper	The Quebec & St. Maurice Industrial Co.	St. George, Beauce, P. Q.
"	"	"	"
Martin, A. W.	"	"	"
Meredith, R.	Notary Public firm of	Meredith & Meredith	Quebec, P. Q.
Mooney, J. S.	Bookkeeper	Berlin Mills Company	Berlin, N. H.

ATTENDANCE—Continued

NAME	POSITION	COMPANY	ADDRESS
O'Brien, Dan	Walking Boss		Houghton, Me
Page, J. H.	Head Sailer	The Quebec & St. Mary's Ice Manufacturing Co.	Ice House, P. Q.
Perrin, J. V.	Local Manager		St. Lawrence, P. Q.
Pratt, C. J.	Mill Supt.		St. Lawrence, P. Q.
Prince, P. J.	Head Sailer		St. George, N. H.
Redmond, S.	Inspector		
Robichaud, J. E.	Local Manager		St. Denis, P. Q.
Rowell, A. E.	Steam Engineer	Berlin Mills Company	Berlin, N. H.
Sawyer, R. J.	Storehouse Manager	The Quebec & St. Mary's Ice Manufacturing Co.	Ice House, P. Q.
Stewart, D. T.	Paymaster Agent		St. Lawrence, P. Q.
Swan, W. F.	Bookkeeper	Berlin Mills Company	Berlin, N. H.
Taylor, J. A.	Local Manager	The Quebec & St. Mary's Ice Industrial Co.	Ice House, P. Q.
Thompson, E. W.	Accountant	Berlin Mills Company	Berlin, N. H.
Tracy, T. J.	Walking Boss		Westbrook, N. H.
Wells, J. P., K. C.	Lawyer of firm of	Cate, Wells & White	Southbrook, P. Q.
Wood, E. N.	Accountant	Berlin Mills Co.	Portland, Me.



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